# Team 5 Codebook - Baby Cry Project

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## Libraries:

```r
library(tidyverse)
library(readxl)
library(dplyr)
library(ggplot2)
library(ggpubr)
library(janitor)
library(randomForest)
library(mice)
library(caret)
library(xgboost)
library(MLmetrics)
library(reshape2)
library(pROC)
library(factoextra)
library(e1071)
library(stats)
library(igraph)
library(kernlab)
library(dbscan)
library(knitr)
library(mclust)
library(cluster)
library(nnet)
library(GGally)
library(skimr)
```

```r
full_data_odd <- read_csv("./Data/filtered_full_data_odd.csv")
```

```
Rows: 1250 Columns: 27
-- Column specification --------------------------------------------------------
Delimiter: ","
chr  (2): ParentFile, Filename
dbl (25): shimmerLocaldB_sma3nz_stddevNorm, loudness_sma3_percentile20.0, F3...

i Use `spec()` to retrieve the full column specification for this data.
i Specify the column types or set `show_col_types = FALSE` to quiet this message.
```

```r
demographics <- read_csv("./Data/demographics_students.csv")
```

```
Rows: 2500 Columns: 6
-- Column specification --------------------------------------------------------
Delimiter: ","
chr (4): ID, Reason, Age, Gender
dbl (2): Date, sample

i Use `spec()` to retrieve the full column specification for this data.
i Specify the column types or set `show_col_types = FALSE` to quiet this message.
```

## Cleaning:

Find the groups of demographics dataset:

```
demographics %>%
  group_by(Reason) %>%
  summarise(count = n())
```

```
# A tibble: 5 x 2
  Reason        count
  <chr>         <int>
1 Diaper-Change   500
2 Fussy           500
3 Hungry          500
4 Pain            500
5 Tired           500
```

I see some no email and no gender and no age. clean the demographics data

```
# demographics <- demographics %>%
#   filter(ID != 'NO-EMAIL', Age != 'NO-AGE', Gender != 'NO-GENDER')
#
# demographics %>%
#   group_by(Reason) %>%
#   summarise(count = n())
```

```
full_data_odd %>%
  group_by(ParentFile) %>%
  summarise(count = n())
```

```
# A tibble: 5 x 2
  ParentFile             count
  <chr>                  <int>
1 gemaps_part_diaper.csv   250
2 gemaps_part_fussy.csv    250
3 gemaps_part_hungry.csv   250
4 gemaps_part_pain.csv     250
5 gemaps_part_tired.csv    250
```

```
demographics %>%
  group_by(Reason) %>%
  summarise(count = n())
```

```
# A tibble: 5 x 2
  Reason        count
  <chr>         <int>
1 Diaper-Change   500
2 Fussy           500
3 Hungry          500
4 Pain            500
5 Tired           500
```

Join the two datasets:

```r
# # Filter out email and no email separately
# demographics_no_em <- demographics %>%
#   filter(ID == "NO-EMAIL")
# demographics_em <- demographics %>%
#   filter(ID != "NO-EMAIL")

# full_data_no_em <- full_data_odd %>%
#   filter(str_detect(Filename, "^NO-EMAIL"))
# full_data_em <- full_data_odd %>%
#   filter(!str_detect(Filename, "^NO-EMAIL"))

# For the email, join by ID
full_data_mod <- full_data_odd %>%
  #mutate(ID = str_split(Filename, "_")[1]) %>%
  separate(Filename, into = paste0("Comp", 1:8), sep = "_") %>%
  relocate(paste0("Comp", 1:8), .before = ParentFile) %>%
  rename(ID = `Comp1`, Reason = Comp2, Age = Comp3, Gender = Comp4, Date = Comp5, Sample = Comp6)
  ↪  %>%
  select(-Comp7, -Comp8)

# join_em <- left_join(full_data_em, demographics_em)

# For the no email, join by the sample ID plus date
```

```r
# write_csv(full_data_mod, "full_data_mod.csv")
```

## Question 1: EDA

```r
# reading in data
full_data_odd <- read.csv("./Data/filtered_full_data_odd.csv", header = TRUE)
demographics <- read.csv("./Data/demographics_students.csv", header = TRUE)
```

```r
# analyze rows
head(demographics)
```

```
                                ID        Reason    Age    Gender   Date
1 bfb4662ea7ea4b8468d74c7ad1909ef1 Diaper-Change     49    female 181002
2 79eb1cf511da7ca57dd1996f0e0dca9e Diaper-Change    122    female 210811
3 1bb7c3a247deb74ec63b50048d97295b Diaper-Change NO-AGE      male 210609
```

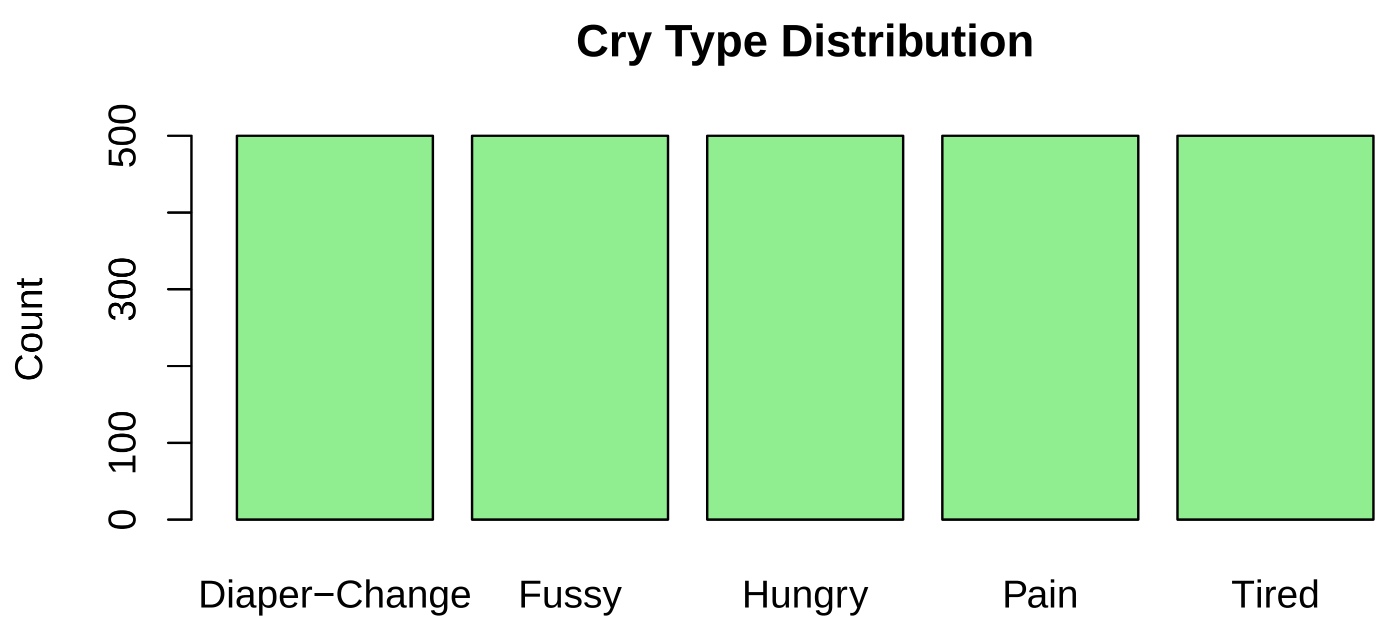
```
4 aefc074bf9d634beeb762f45600060b7 Diaper-Change NO-AGE    female 220223
5                         NO-EMAIL Diaper-Change NO-AGE NO-GENDER 181223
6 5c78e65a7f0c779bc56ef188171ec829 Diaper-Change    241    female 180810
   sample
1  340074
2 1099184
3 1048016
4 1306174
5  402716
6  283764
```

#### Reason Distribution Bar Plot

```r
# see how the distributions stack up
table(demographics$Reason)
```

```
Diaper-Change         Fussy        Hungry          Pain         Tired
          500           500           500           500           500
```

```r
barplot(table(demographics$Reason),
        col = "lightgreen",
        main = "Cry Type Distribution",
        ylab = "Count")
```

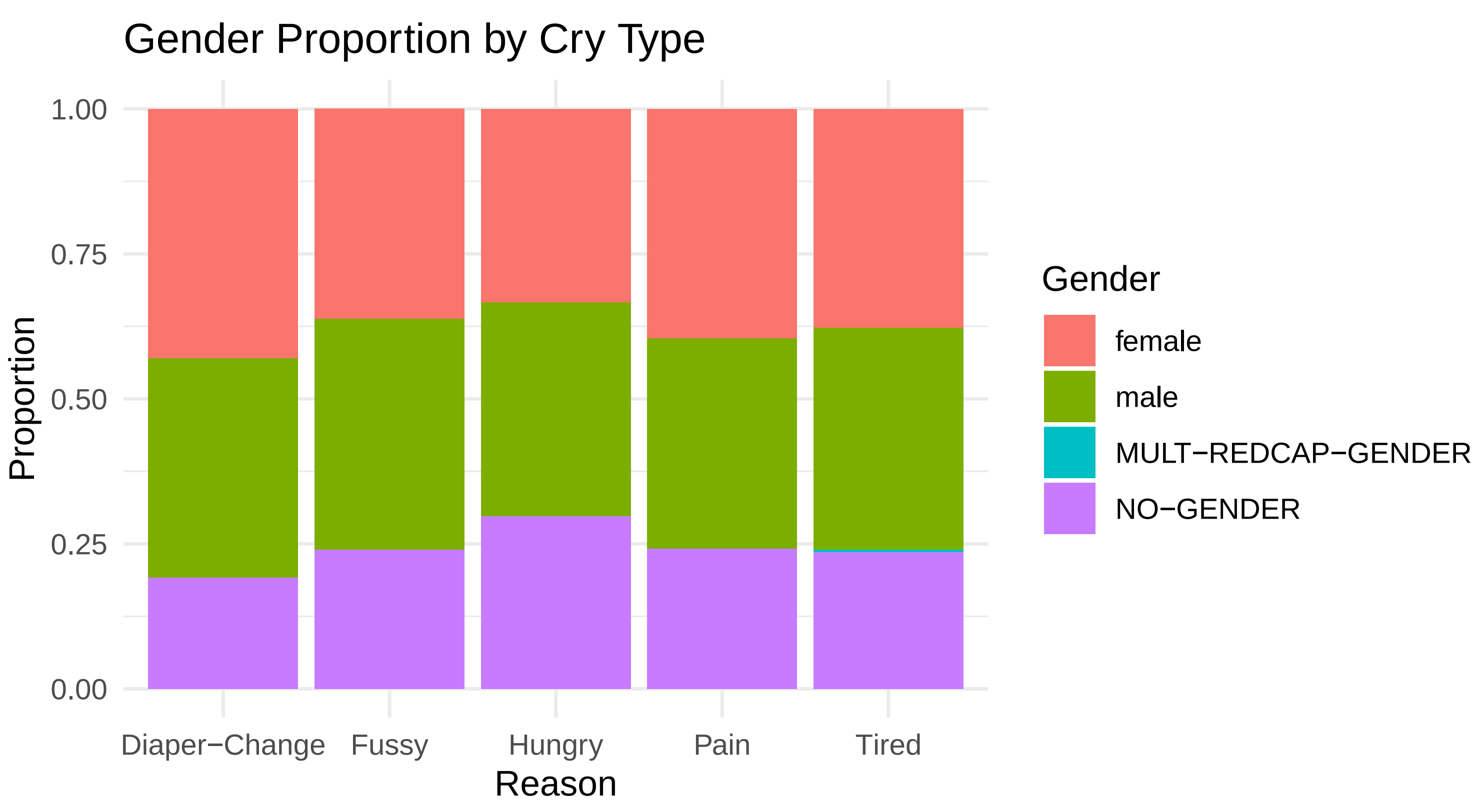


### Reason with Gender Proportion

```r
# see how the reasons vary with gender
table(demographics$Gender, demographics$Reason)
```

```
                     Diaper-Change Fussy Hungry Pain Tired
  female                       215   181    167  198   189
  male                         189   199    184  181   191
  MULT-REDCAP-GENDER             0     0      0    0     2
  NO-GENDER                     96   120    149  121   118
```

```r
library(ggplot2)
ggplot(demographics, aes(x = Reason, fill = Gender)) +
  geom_bar(position = "fill") +
  labs(title = "Gender Proportion by Cry Type", y = "Proportion") +
  theme_minimal()
```




### Chi-Square

```r
# chi square test between gender and reason
chisq.test(table(demographics$Gender, demographics$Reason))
```

```
Warning in stats::chisq.test(x, y, ...): Chi-squared approximation may be
incorrect
```

```
    Pearson's Chi-squared test

data:  table(demographics$Gender, demographics$Reason)
X-squared = 27.608, df = 12, p-value = 0.00631
```

### ANOVA w/ removed missing ages

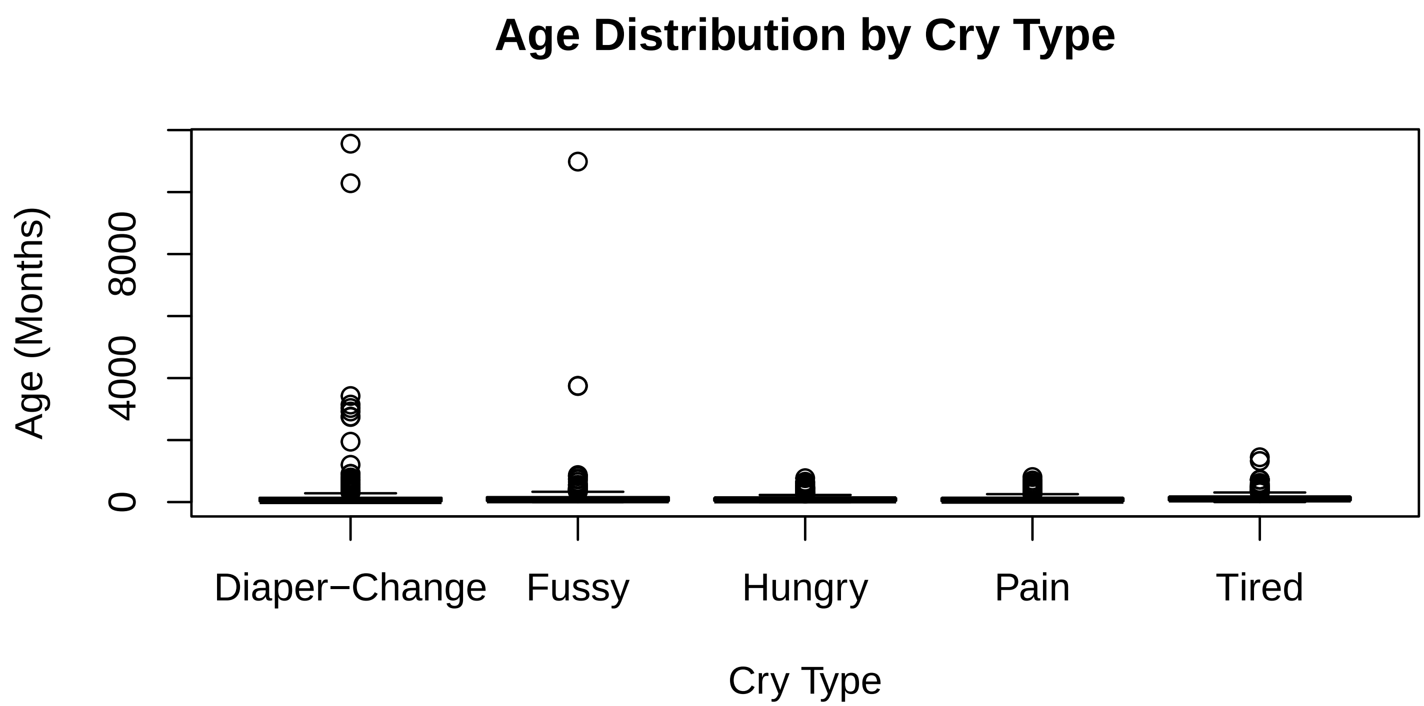
```r
# anova between age and reason
# convert missing ages to NA
demographics$Age[demographics$Age == "NO-AGE"] <- NA
demographics$Age <- as.numeric(demographics$Age)
```

```
Warning: NAs introduced by coercion
```

```r
anova_result <- aov(Age ~ Reason, data = demographics)
summary(anova_result)
```

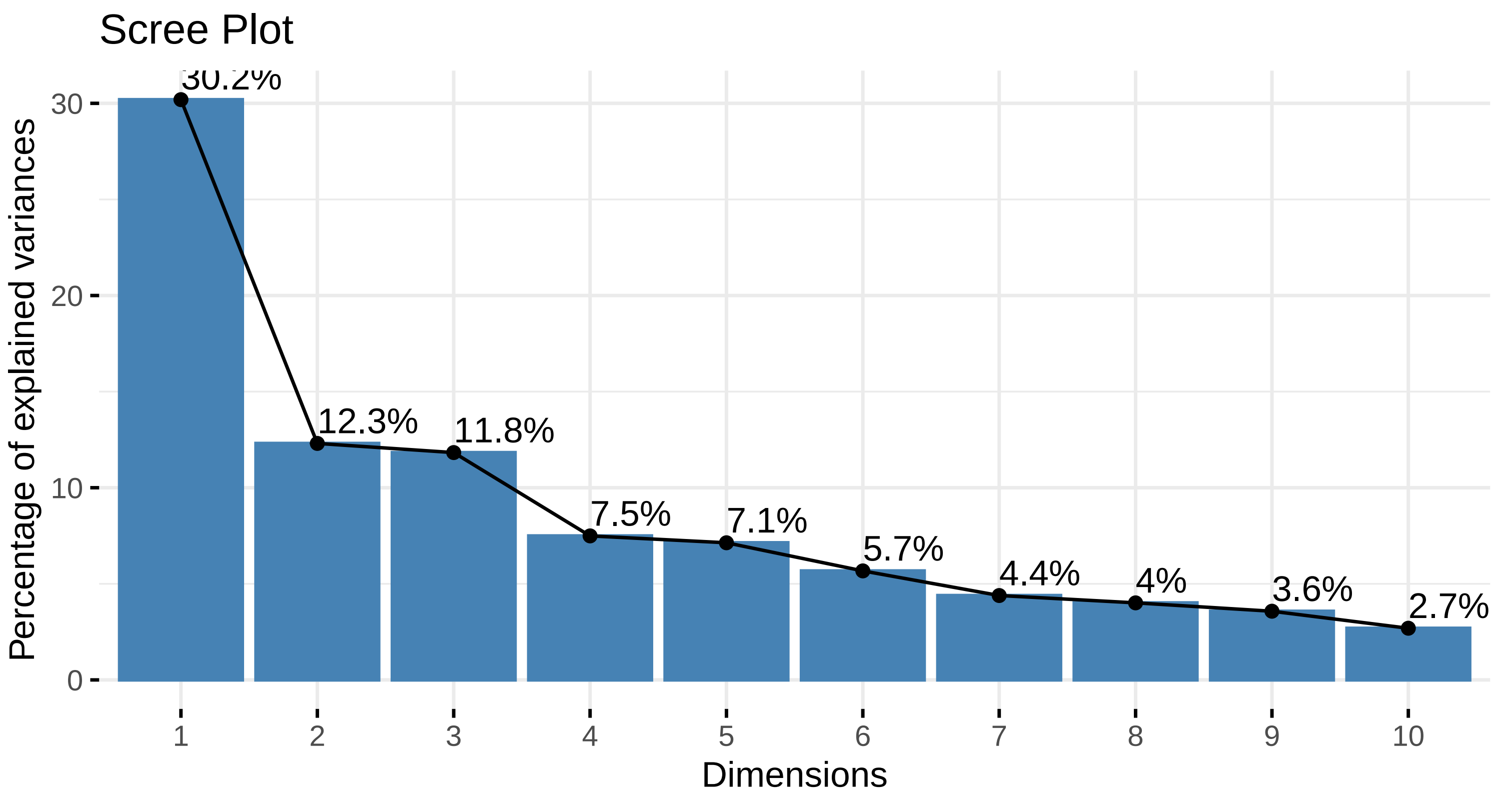
```
              Df    Sum Sq Mean Sq F value  Pr(>F)
Reason         4   3832052  958013   3.648 0.00575 **
Residuals   1761 462429901  262595
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
734 observations deleted due to missingness
```

```r
# visuaally see age by reason
boxplot(Age ~ Reason, data = demographics,
        main = "Age Distribution by Cry Type",
        xlab = "Cry Type",
        ylab = "Age (Months)",
        col = "lightgreen")
```




**Scree Plot by Cry Acoustics Dimensions**

```
# see how the acoustic feastures measure
library(factoextra)
# get numeric only
acoustic_features <- full_data_odd %>%
  select(where(is.numeric)) %>%
  na.omit()

#scale for scree plot
scaled_features <- scale(acoustic_features)
pca <- prcomp(scaled_features, center = TRUE, scale. = TRUE)

# plot the scree plot
fviz_eig(pca, addlabels = TRUE, barfill = "steelblue") +
  labs(title = "Scree Plot")
```




**Summary Statistics**

```
data6 <- read.csv("full_data_cleaned_without_nas.csv", header=TRUE) #loading data
data <- data6

# Summary stats variables
skim(data6)
```

Table 1: Data summary

| | |
|---|---|
| Name | data6 |
| Number of rows | 868 |
| Number of columns | 33 |
| Column type frequency: | |
| character | 4 |
| numeric | 29 |
| Group variables | None |

**Variable type: character**

| skim_variable | n_missing | complete_rate | min | max | empty | n_unique | whitespace |
|---|---|---|---|---|---|---|---|
| ID | 0 | 1 | 32 | 32 | 0 | 822 | 0 |
| Reason | 0 | 1 | 4 | 13 | 0 | 5 | 0 |
| Gender | 0 | 1 | 4 | 6 | 0 | 2 | 0 |
| ParentFile | 0 | 1 | 4 | 6 | 0 | 5 | 0 |

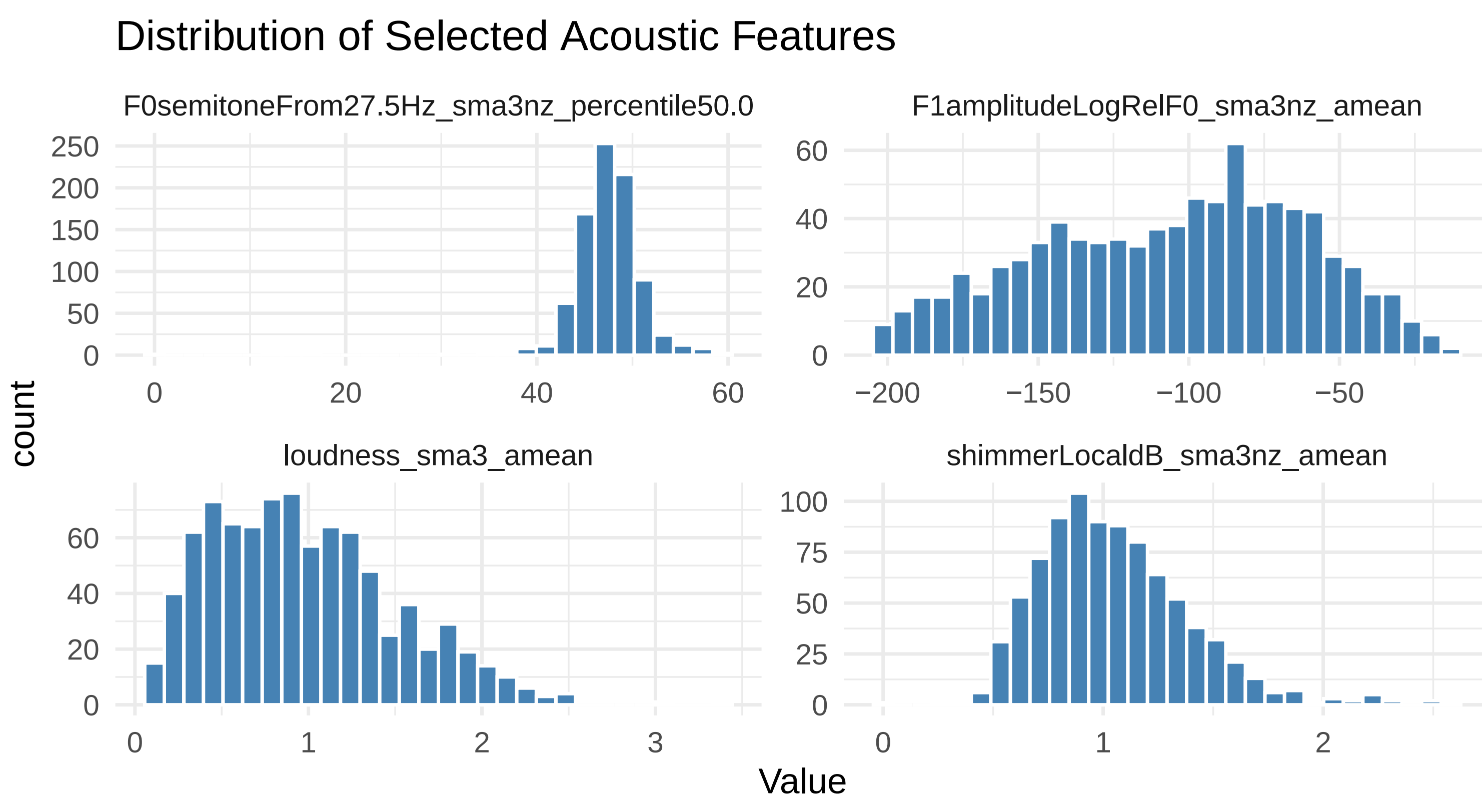
**Variable type: numeric**

| skim_variable | n_missing | complete_rate | mean | sd | p0 | p25 | p50 | p75 | p100 | hist |
|---|---|---|---|---|---|---|---|---|---|---|
| newID | 0 | 1 | 620.69 | 361.92 | 1.00 | 309.50 | 618.00 | 941.25 | 1250.00 | |
| Age | 0 | 1 | 173.88 | 689.98 | -1.00 | 37.00 | 73.50 | 139.00 | 11561.00 | |
| Date | 0 | 1 | 189951.12 | 13503.70 | 180516.00 | 180628.00 | 180825.50 | 195667.75 | 220307.00 | |
| Sample | 0 | 1 | 471968.45 | 408597.23 | 14262.00 | 153291.75 | 305825.00 | 667055.75 | 1321011.00 | |
| shimmerLocaldB_sma3nz_stddevNorm | 0 | 1 | 0.74 | 0.23 | 0.00 | 0.59 | 0.72 | 0.88 | 1.76 | |
| loudness_sma3_percentile20.0 | 0 | 1 | 0.31 | 0.26 | 0.01 | 0.13 | 0.23 | 0.43 | 2.63 | |
| F3amplitudeLogRelF0_sma3nz_amean | 0 | 1 | -96.11 | 41.59 | -201.00 | -125.00 | -89.53 | -65.08 | -4.44 | |
| loudness_sma3_percentile50.0 | 0 | 1 | 0.85 | 0.62 | 0.02 | 0.35 | 0.71 | 1.20 | 3.74 | |
| loudness_sma3_amean | 0 | 1 | 0.98 | 0.53 | 0.07 | 0.55 | 0.92 | 1.30 | 3.35 | |
| F2amplitudeLogRelF0_sma3nz_amean | 0 | 1 | -94.68 | 42.17 | -201.00 | -124.14 | -88.53 | -63.58 | -0.75 | |
| F3amplitudeLogRelF0_sma3nz_stddevNorm | 0 | 1 | -1.11 | 0.79 | -15.33 | -1.33 | -1.02 | -0.72 | 0.00 | |
| MeanUnvoicedSegmentLength | 0 | 1 | 0.33 | 0.38 | 0.03 | 0.16 | 0.23 | 0.38 | 4.93 | |
| F2amplitudeLogRelF0_sma3nz_stddevNorm | 0 | 1 | -1.26 | 3.27 | -95.48 | -1.40 | -1.06 | -0.74 | 0.00 | |
| F0semitoneFrom27.5Hz_sma3nz_percentile80.0 | 0 | 1 | 49.94 | 4.40 | 0.00 | 47.77 | 49.63 | 51.64 | 62.20 | |
| F1amplitudeLogRelF0_sma3nz_amean | 0 | 1 | -105.95 | 44.14 | -201.00 | -140.67 | -100.39 | -71.78 | -12.54 | |
| F0semitoneFrom27.5Hz_sma3nz_pctlrange0.2 | 0 | 1 | 6.75 | 6.53 | 0.00 | 3.11 | 4.67 | 7.96 | 47.69 | |
| alphaRatioV_sma3nz_stddevNorm | 0 | 1 | 1.24 | 80.10 | -725.55 | -1.34 | 0.34 | 1.57 | 2138.09 | |
| StddevUnvoicedSegmentLength | 0 | 1 | 0.27 | 0.24 | 0.00 | 0.11 | 0.19 | 0.33 | 1.86 | |
| loudness_sma3_stddevNorm | 0 | 1 | 0.76 | 0.25 | 0.25 | 0.59 | 0.72 | 0.87 | 1.98 | |
| loudness_sma3_percentile80.0 | 0 | 1 | 1.62 | 0.89 | 0.10 | 0.88 | 1.56 | 2.18 | 5.22 | |
| shimmerLocaldB_sma3nz_amean | 0 | 1 | 1.05 | 0.34 | 0.00 | 0.80 | 1.01 | 1.25 | 2.58 | |
| F0semitoneFrom27.5Hz_sma3nz_stddevNorm | 0 | 1 | 0.11 | 0.08 | 0.00 | 0.06 | 0.09 | 0.13 | 0.68 | |
| F0semitoneFrom27.5Hz_sma3nz_percentile50.0 | 0 | 1 | 47.26 | 4.46 | 0.00 | 45.66 | 47.52 | 49.20 | 59.41 | |
| HNRdBACF_sma3nz_amean | 0 | 1 | 7.72 | 3.12 | -2.41 | 5.59 | 7.85 | 9.93 | 16.11 | |
| slopeV500.1500_sma3nz_amean | 0 | 1 | 0.00 | 0.01 | -0.04 | -0.01 | 0.00 | 0.01 | 0.05 | |
| loudness_sma3_meanRisingSlope | 0 | 1 | 7.96 | 5.34 | -1.54 | 4.03 | 6.87 | 10.52 | 34.88 | |
| alphaRatioV_sma3nz_amean | 0 | 1 | 0.36 | 8.08 | -27.30 | -5.38 | 0.22 | 5.71 | 24.36 | |
| F0semitoneFrom27.5Hz_sma3nz_percentile20.0 | 0 | 1 | 43.19 | 6.94 | 0.00 | 41.92 | 44.81 | 46.79 | 56.82 | |
| F1amplitudeLogRelF0_sma3nz_stddevNorm | 0 | 1 | -1.05 | 0.58 | -5.03 | -1.32 | -0.98 | -0.65 | 0.00 | |

### Histogram of Features

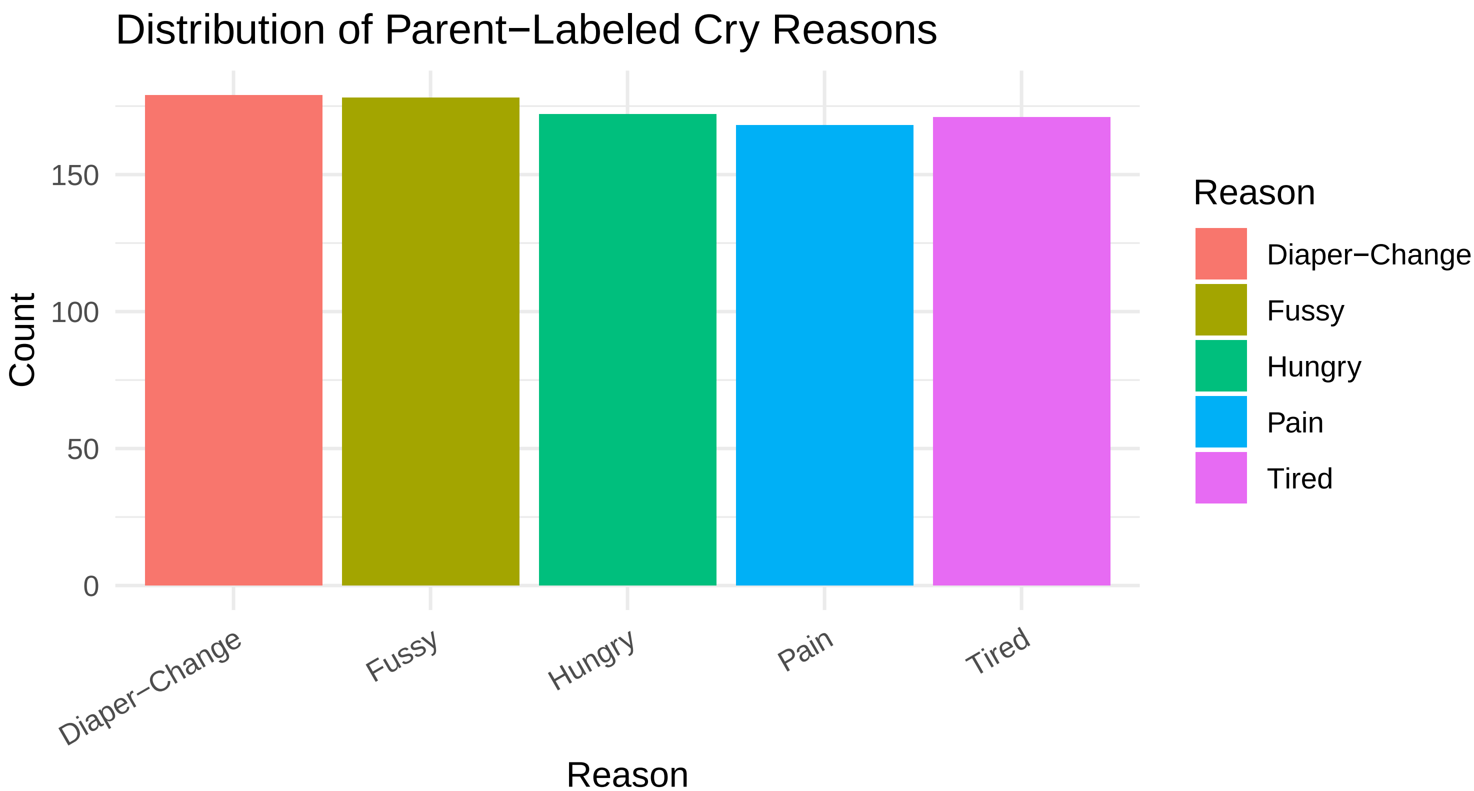
```
# Histograms of some acoustic features
acoustic_subset <- data6 %>%
  select(loudness_sma3_amean,
         F0semitoneFrom27.5Hz_sma3nz_percentile50.0,
         shimmerLocaldB_sma3nz_amean,
         F1amplitudeLogRelF0_sma3nz_amean)

# histogram setup
acoustic_long <- acoustic_subset %>%
  pivot_longer(everything(), names_to = "Feature", values_to = "Value")

# create histograms
ggplot(acoustic_long, aes(x = Value)) +
```

```
  geom_histogram(bins = 30, fill = "steelblue", color = "white") +
  facet_wrap(~ Feature, scales = "free", ncol = 2) +
  theme_minimal() +
  labs(title = "Distribution of Selected Acoustic Features")
```



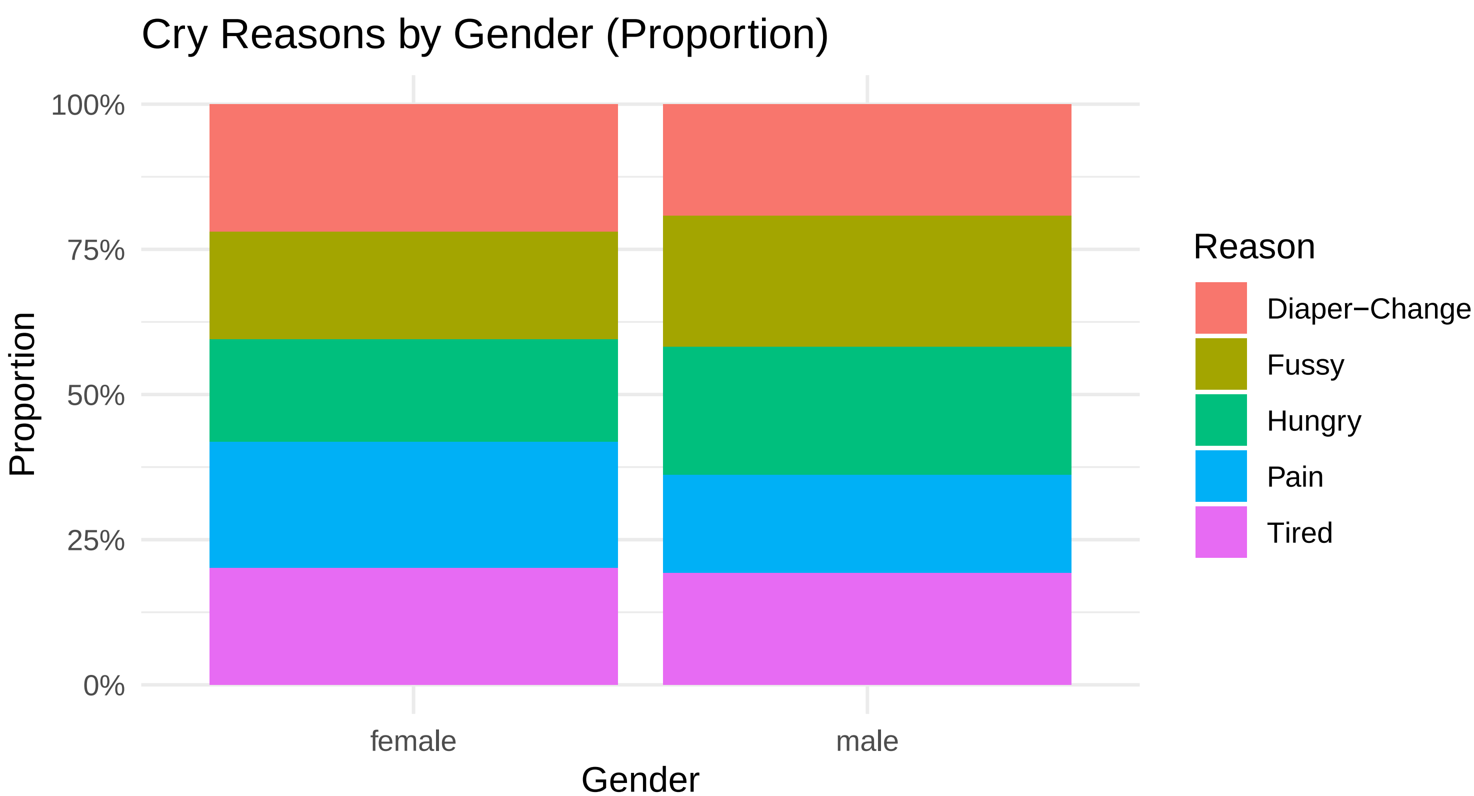

**Distribution After Cleaning Data:**

```
# eda: dist after cleaing data
ggplot(data6, aes(x = Reason, fill = Reason)) +
  geom_bar() +
  theme_minimal() +
  labs(title = "Distribution of Parent-Labeled Cry Reasons", x = "Reason", y = "Count") +
  theme(axis.text.x = element_text(angle = 30, hjust = 1))
```



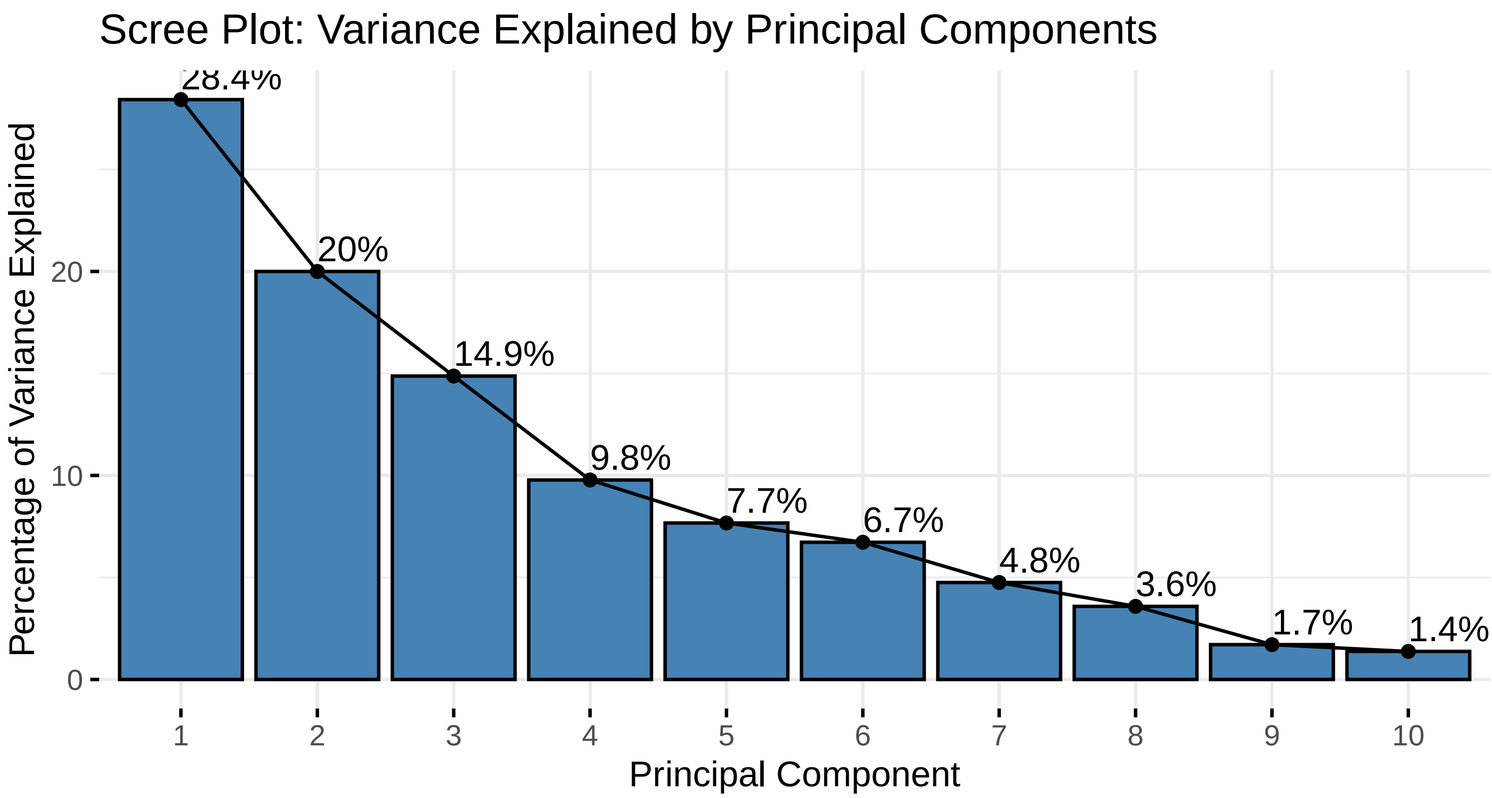

**Reason by Gender Plot**

```
# reason by gender plot
ggplot(data6, aes(x = Gender, fill = Reason)) +
  geom_bar(position = "fill") +
  scale_y_continuous(labels = scales::percent) +
  labs(title = "Cry Reasons by Gender (Proportion)", y = "Proportion") +
  theme_minimal()
```




**PCA Components**

```
pca_data <- data %>% # obtain pca data for narrowing variables
  select(starts_with("shimmer"),
         starts_with("F0"),
         starts_with("alpha"),
         starts_with("F1"),
         starts_with("F2")) %>%
  na.omit()

scaled_pca_data <- scale(pca_data) # scaling data

pca <- prcomp(scaled_pca_data, center = TRUE, scale. = TRUE)

# plot the pca
fviz_eig(pca,
         addlabels = TRUE,
         barfill = "steelblue",
         barcolor = "black") +
  labs(title = "Scree Plot: Variance Explained by Principal Components",
       x = "Principal Component",
       y = "Percentage of Variance Explained")
```




```r
head(pca$rotation)
```

```
                                                  PC1        PC2        PC3
shimmerLocaldB_sma3nz_stddevNorm           0.14060167 -0.2277505  0.1181830
shimmerLocaldB_sma3nz_amean               -0.19888243  0.2829413 -0.2517309
F0semitoneFrom27.5Hz_sma3nz_percentile80.0  0.08453555  0.3675123 -0.4520854
F0semitoneFrom27.5Hz_sma3nz_pctlrange0.2  -0.31991083 -0.1730493 -0.4920759
F0semitoneFrom27.5Hz_sma3nz_stddevNorm    -0.33579359 -0.2221301 -0.3931566
F0semitoneFrom27.5Hz_sma3nz_percentile50.0  0.19478719  0.4187253 -0.2476559
                                                 PC4          PC5          PC6
shimmerLocaldB_sma3nz_stddevNorm           0.6113230 -0.078572404 -0.154634749
shimmerLocaldB_sma3nz_amean               -0.4048324  0.009026781  0.155641722
F0semitoneFrom27.5Hz_sma3nz_percentile80.0  0.3462639 -0.047279228  0.052364008
F0semitoneFrom27.5Hz_sma3nz_pctlrange0.2   0.1456982 -0.030310265  0.025561808
F0semitoneFrom27.5Hz_sma3nz_stddevNorm     0.1045340 -0.012357769  0.006258527
F0semitoneFrom27.5Hz_sma3nz_percentile50.0  0.3490690 -0.034529828  0.038692272
                                                  PC7         PC8         PC9
shimmerLocaldB_sma3nz_stddevNorm          -0.41584646  0.57751810  0.05605189
shimmerLocaldB_sma3nz_amean                0.13664452  0.77599034  0.05747031
F0semitoneFrom27.5Hz_sma3nz_percentile80.0  0.10803950 -0.04580176 -0.21182055
F0semitoneFrom27.5Hz_sma3nz_pctlrange0.2  -0.04104088 -0.10468064  0.34650253
F0semitoneFrom27.5Hz_sma3nz_stddevNorm    -0.10110678 -0.04419690 -0.65588479
F0semitoneFrom27.5Hz_sma3nz_percentile50.0  0.15347305 -0.11672533  0.38471018
                                                  PC10        PC11
shimmerLocaldB_sma3nz_stddevNorm           0.003899279  0.01308935
shimmerLocaldB_sma3nz_amean               -0.063155752 -0.02233004
F0semitoneFrom27.5Hz_sma3nz_percentile80.0  0.538763936  0.03771055
F0semitoneFrom27.5Hz_sma3nz_pctlrange0.2   0.280639918 -0.06396673
F0semitoneFrom27.5Hz_sma3nz_stddevNorm    -0.450214466  0.16147718
F0semitoneFrom27.5Hz_sma3nz_percentile50.0 -0.644141475 -0.02395427
```

```
                                                   PC12          PC13
shimmerLocaldB_sma3nz_stddevNorm           -0.028435276  1.570508e-08
shimmerLocaldB_sma3nz_amean                -0.014266926  2.495110e-08
F0semitoneFrom27.5Hz_sma3nz_percentile80.0  0.049052825  4.192829e-01
F0semitoneFrom27.5Hz_sma3nz_pctlrange0.2    0.002301818 -6.222620e-01
F0semitoneFrom27.5Hz_sma3nz_stddevNorm      0.032875355 -1.672766e-08
F0semitoneFrom27.5Hz_sma3nz_percentile50.0  0.013501964  2.981236e-08
```

## Question 2: Unsupervised learning

### K-means Clustering Attempt 1

```r
data <- read.csv("./full_data_cleaned_without_nas.csv", header=TRUE) #loading data
data2 <- data
data2$Reason <- as.factor(data$Reason) # factor data

set.seed(333) # set up training data
trainIndex <- createDataPartition(data2$Reason, p = 0.8, list = FALSE)
trainData <- data2[trainIndex, ]
testData <- data2[-trainIndex, ]

ctrl <- trainControl(method = "cv", number = 10, verboseIter = FALSE)
```

```r
# tart fresh
data5 <- data

# only acoustic data
acoustic_numeric <- data5 %>%
  select(where(is.numeric))

# Scale the features
acoustic_scaled <- scale(acoustic_numeric)

#k-means clustering (k=5)
set.seed(123)
k <- 5
kmeans_res <- kmeans(acoustic_scaled, centers = k, nstart = 25)

# add cluster labels to data5
data5$Cluster <- factor(kmeans_res$cluster)

#print results
table(Cluster = data5$Cluster, Reason = data5$Reason)
```

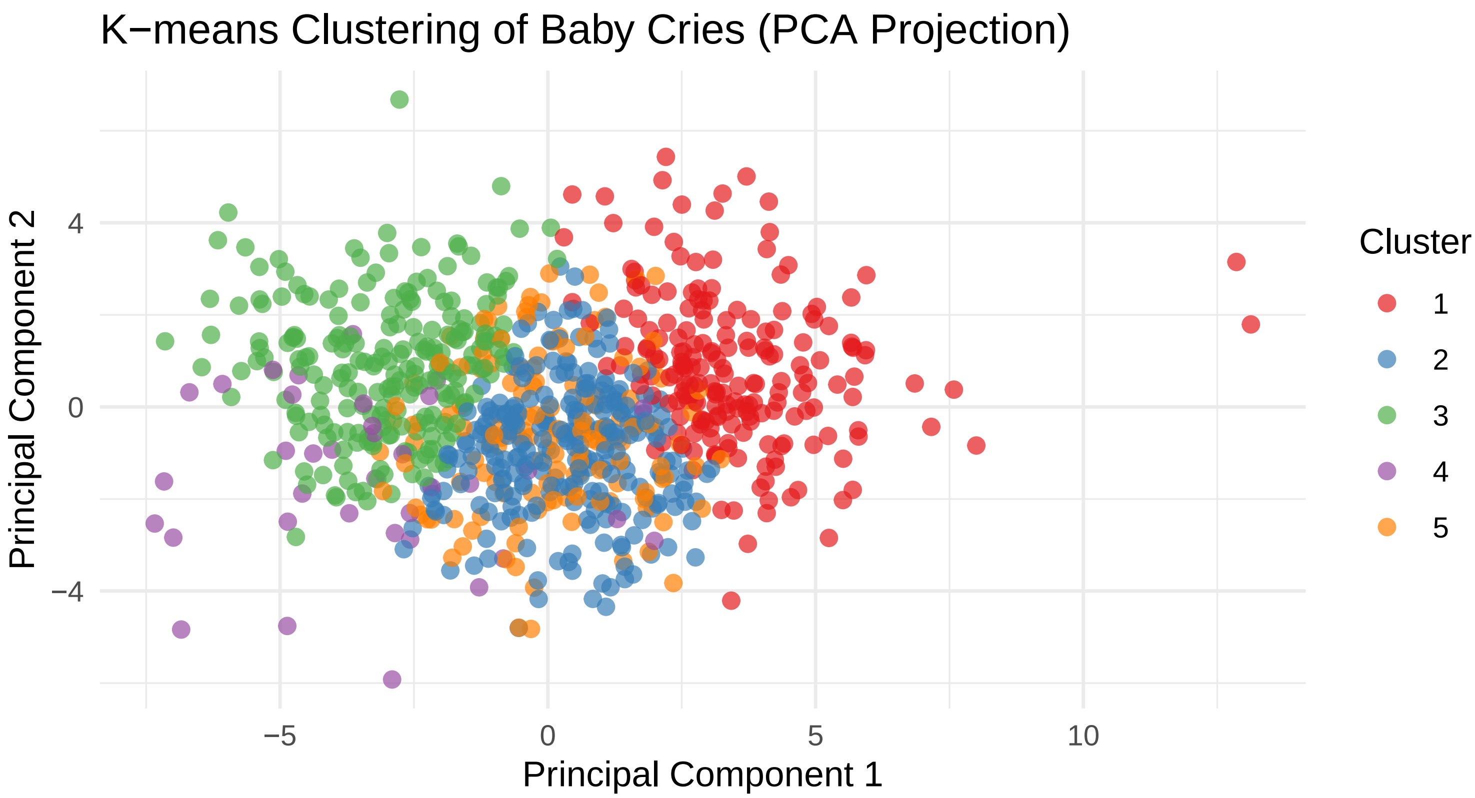
```
       Reason
Cluster Diaper-Change Fussy Hungry Pain Tired
      1            45    22     50   56    28
      2            45    34     76   47    61
      3            48    70     41   28    40
      4             9     8      5    7     7
      5            32    44      0   30    35
```

```r
data5$Cluster <- factor(data5$Cluster)  # facotr data

#prepare dataset for classification
dataset_for_cluster_pred <- data5 %>%
  select(-Reason, -Gender, -Age, -newID, -Date, -Sample)  # keep acoustic + Cluster

# 10-fold cross-validation
set.seed(123)
ctrl <- trainControl(method = "cv", number = 10, verboseIter = FALSE)

# rando forest to predict clusters from features
invisible(capture.output({
  suppressMessages({
    suppressWarnings({
      cluster_pred_model <- train(
        Cluster ~ .,
        data = dataset_for_cluster_pred,
        method = "rf",
        trControl = ctrl
      )
    })
  })
}))

# CV accuracy for predicting clusters
mean(cluster_pred_model$resample$Accuracy)
```

```
[1] 0.7799013
```

**K means Clustering w/ PCA**

```r
# PCA
pca_kmeans <- prcomp(acoustic_scaled)

# fist two PCs
pca_df <- as.data.frame(pca_kmeans$x[, 1:2])
pca_df$Cluster <- factor(data5$Cluster)

# Plot
ggplot(pca_df, aes(x = PC1, y = PC2, color = Cluster)) +
  geom_point(alpha = 0.7, size = 2) +
  labs(title = "K-means Clustering of Baby Cries (PCA Projection)",
       x = "Principal Component 1",
       y = "Principal Component 2") +
  theme_minimal() +
  scale_color_brewer(palette = "Set1")
```




```r
# table for predicitng clusters
table(Cluster = data5$Cluster, Reason = data5$Reason)
```

```
       Reason
Cluster Diaper-Change Fussy Hungry Pain Tired
      1            45    22     50   56    28
      2            45    34     76   47    61
      3            48    70     41   28    40
      4             9     8      5    7     7
      5            32    44      0   30    35
```

```r
data7 <- data
# ACOUSTIC ONLY AGAIN
acoustic_only2 <- data7 %>%
  select(-Reason, -Gender, -Age, -newID, -ID, -Date, -Sample, -ParentFile)

acoustic_scaled <- scale(acoustic_only2)

# K-means clustering
set.seed(123)
kmeans_model <- kmeans(acoustic_scaled, centers = 5, nstart = 25)

# Add cluster labels
data7$Cluster <- as.factor(kmeans_model$cluster)
```

```r
set.seed(123)

ctrl <- trainControl(method = "cv", number = 10, verboseIter = FALSE)
```

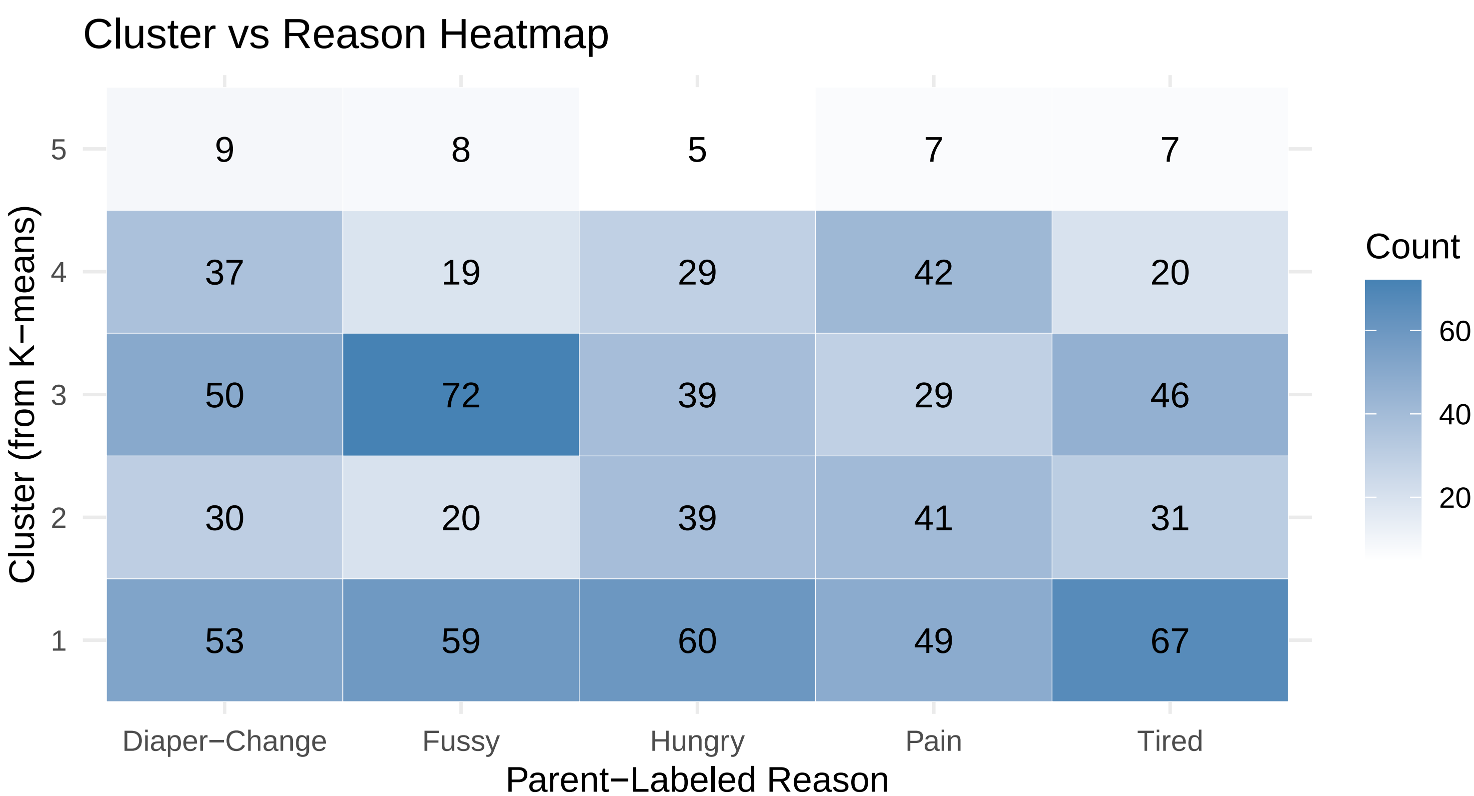
```r
# RF model using only Cluster to predict Reason
invisible(capture.output({
  suppressMessages({
    suppressWarnings({
      rf_cluster_model <- train(
        Reason ~ Cluster,
        data = data7,
        method = "rf",
        trControl = ctrl
      )
    })
  })
}))

# average cross-validated accuracy
mean(rf_cluster_model$resample$Accuracy)
```

```
[1] 0.2499599
```

```r
# table for results
table_cluster_reason <- table(data7$Cluster, data7$Reason)
table_cluster_reason
```

```
    Diaper-Change Fussy Hungry Pain Tired
  1            53    59     60   49    67
  2            30    20     39   41    31
  3            50    72     39   29    46
  4            37    19     29   42    20
  5             9     8      5    7     7
```

```r
# Convert to data frame for plotting

conf_df <- as.data.frame(table_cluster_reason)
colnames(conf_df) <- c("Cluster", "Reason", "Count")

ggplot(conf_df, aes(x = Reason, y = Cluster, fill = Count)) +
  geom_tile(color = "white") +
  geom_text(aes(label = Count), color = "black", size = 4) +
  scale_fill_gradient(low = "white", high = "steelblue") +
  labs(title = "Cluster vs Reason Heatmap",
       x = "Parent-Labeled Reason",
       y = "Cluster (from K-means)") +
  theme_minimal()
```




```r
# Create a contingency table
table(data7$Cluster, data7$Reason)
```

```
    Diaper-Change Fussy Hungry Pain Tired
  1            53    59     60   49    67
  2            30    20     39   41    31
  3            50    72     39   29    46
  4            37    19     29   42    20
  5             9     8      5    7     7
```

```r
# data frame too
cluster_reason_df <- as.data.frame(table(data7$Cluster, data7$Reason))
print(cluster_reason_df)
```

```
   Var1          Var2 Freq
1     1 Diaper-Change   53
2     2 Diaper-Change   30
3     3 Diaper-Change   50
4     4 Diaper-Change   37
5     5 Diaper-Change    9
6     1         Fussy   59
7     2         Fussy   20
8     3         Fussy   72
9     4         Fussy   19
10    5         Fussy    8
11    1        Hungry   60
12    2        Hungry   39
13    3        Hungry   39
```

```
14    4         Hungry   29
15    5         Hungry    5
16    1           Pain   49
17    2           Pain   41
18    3           Pain   29
19    4           Pain   42
20    5           Pain    7
21    1          Tired   67
22    2          Tired   31
23    3          Tired   46
24    4          Tired   20
25    5          Tired    7
```

```
# show proportions within each cluster
prop.table(table(data7$Cluster, data7$Reason), margin = 1)
```

```
    Diaper-Change     Fussy    Hungry      Pain     Tired
  1     0.1840278 0.2048611 0.2083333 0.1701389 0.2326389
  2     0.1863354 0.1242236 0.2422360 0.2546584 0.1925466
  3     0.2118644 0.3050847 0.1652542 0.1228814 0.1949153
  4     0.2517007 0.1292517 0.1972789 0.2857143 0.1360544
  5     0.2500000 0.2222222 0.1388889 0.1944444 0.1944444
```

#### K-means Clustering Attempt 2

```
# loading incomplete and complete data into R
data_with_nas <- read.csv("full_data_cleaned_include_nas.csv")
data_complete <- read.csv("full_data_cleaned_without_nas.csv")

# removing columns (newID, ID, Date, Sample, ParentFile)
rf_with_nas <- read.csv("full_data_cleaned_include_nas.csv")[, -c(1, 2, 6:8)]
rf_complete <- read.csv("full_data_cleaned_without_nas.csv")[, -c(1, 2, 4:8)]
rf_with_nas$Reason <- as.factor(rf_with_nas$Reason)
rf_complete$Reason <- as.factor(rf_complete$Reason)

# create method vector for mice
methods <- make.method(rf_with_nas)
rf_with_nas$Gender[rf_with_nas$Gender == "MULT-REDCAP-GENDER"] <- NA
rf_with_nas$Gender <- as.factor(rf_with_nas$Gender)
init <- mice(rf_with_nas, maxit = 0)
methods <- init$method
methods["Reason"] <- ""
methods["Gender"] <- "logreg"  # or "polyreg" if >2 levels

# impute missing values using mice
imputed_data <- mice(rf_with_nas, m = 1, method = methods, seed = 605794011)
```

```
 iter imp variable
  1   1  Age  Gender
  2   1  Age  Gender
```

```
  3   1  Age  Gender
  4   1  Age  Gender
  5   1  Age  Gender

Warning: Number of logged events: 10
```

```r
data_imputed <- complete(imputed_data, action = 1)

# ensure target and gender are factors
data_imputed$Reason <- as.factor(data_imputed$Reason)
data_imputed$Gender <- as.factor(data_imputed$Gender)

# set seed for reproducibility
set.seed(605794011)

# train/test split
train_index2 <- createDataPartition(data_imputed$Reason, p = 0.8, list = FALSE)
train_imputed <- data_imputed[train_index2, ]
test_imputed <- data_imputed[-train_index2, ]
```

```r
# remove categorical columns
clust_data <- data_imputed %>%
  select_if(is.numeric)

# scale (standardize) the data
clust_data_scaled <- scale(clust_data)[, -1]

# set seed for reproducibility
set.seed(605794011)

# establish k as number of groups
k <- 5

# run k-means variable
kmeans_result <- kmeans(clust_data_scaled, centers = k, nstart = 25)
print(kmeans_result)
```

```
K-means clustering with 5 clusters of sizes 388, 489, 53, 1, 319

Cluster means:
  shimmerLocaldB_sma3nz_stddevNorm loudness_sma3_percentile20.0
1                      -0.32181019                   -0.5481103
2                       0.32973971                   -0.2367317
3                      -0.44991143                   -0.1268494
4                      -0.08906947                    0.8788965
5                      -0.03901565                    1.0478769
  F3amplitudeLogRelF0_sma3nz_amean loudness_sma3_percentile50.0
1                       -1.0652047                   -0.8046027
2                        0.3356373                   -0.1738951
3                       -0.8886649                   -0.4146459
4                        2.2333977                   -0.1016758
5                        0.9217512                    1.3144153
  loudness_sma3_amean F2amplitudeLogRelF0_sma3nz_amean
1         -0.73942615                       -1.0698033
```

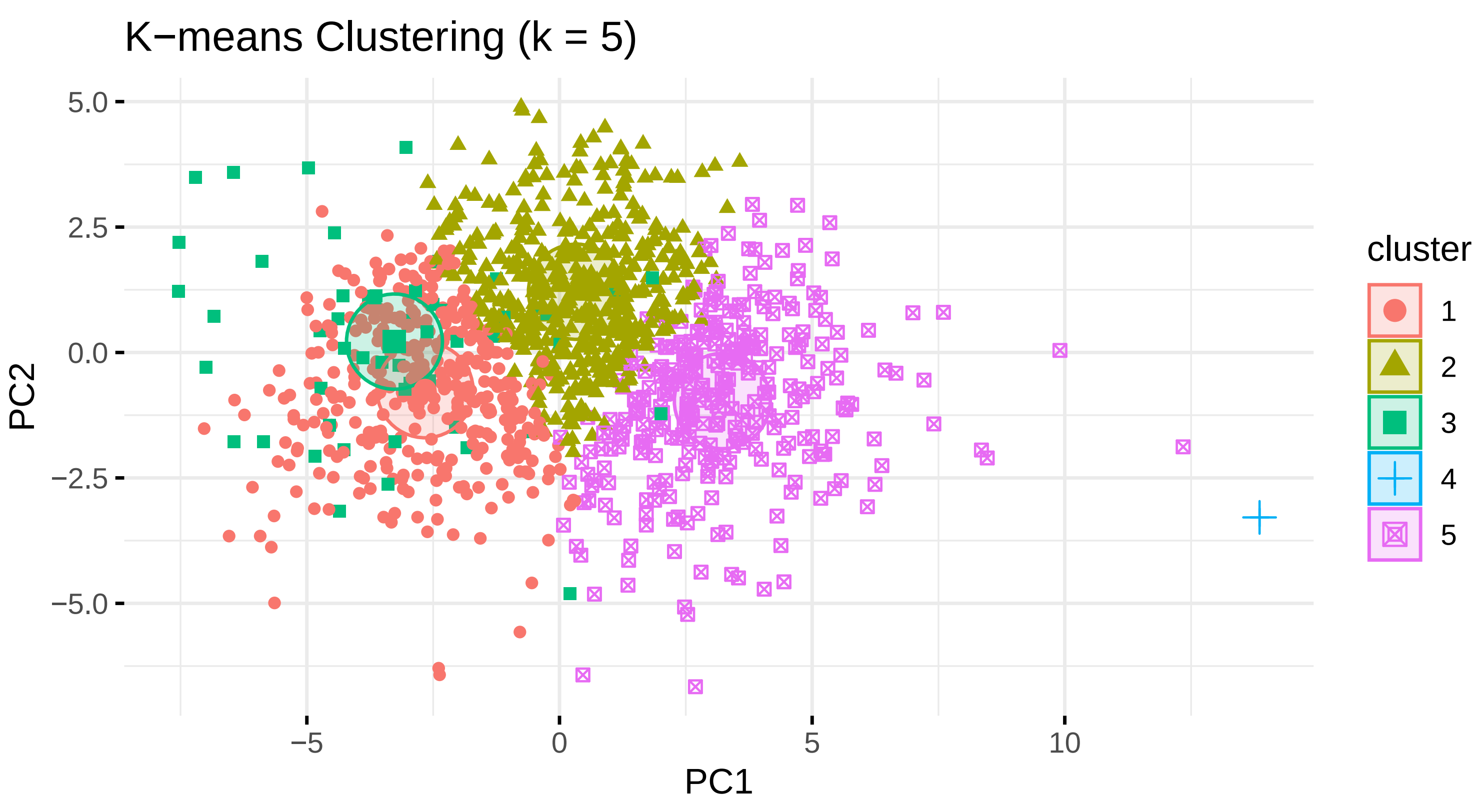
```
2        -0.19241236                        0.3486303
3        -0.43838587                       -0.8814712
4         0.04614704                        2.2534950
5         1.26700719                        0.9061691
  F3amplitudeLogRelF0_sma3nz_stddevNorm MeanUnvoicedSegmentLength
1                            0.63608777                 0.6048689
2                           -0.02150155                -0.2439456
3                            0.63161267                 0.4773037
4                          -19.17557759                -0.7801443
5                           -0.78554135                -0.4386102
  F2amplitudeLogRelF0_sma3nz_stddevNorm
1                            0.21075295
2                            0.01651836
3                            0.20453175
4                          -34.05784428
5                           -0.20887761
  F0semitoneFrom27.5Hz_sma3nz_percentile80.0 F1amplitudeLogRelF0_sma3nz_amean
1                                 0.09795817                       -1.0711121
2                                -0.13437268                        0.4149819
3                                -1.26674525                       -0.7709568
4                                 2.17632572                        1.7622032
5                                 0.29047538                        0.7892284
  F0semitoneFrom27.5Hz_sma3nz_pctlrange0.2 alphaRatioV_sma3nz_stddevNorm
1                              -0.06616199                  -0.017495302
2                              -0.20140314                  -0.048697149
3                               3.25423181                  -0.025148063
4                               0.16305650                  -0.005821306
5                              -0.15197604                   0.100124613
  StddevUnvoicedSegmentLength loudness_sma3_stddevNorm
1                  0.85781251               0.66657536
2                 -0.30024284              -0.12508868
3                 -0.04802405              -0.01923197
4                 -1.00374957              -0.43289505
5                 -0.57198583              -0.61445357
  loudness_sma3_percentile80.0 shimmerLocaldB_sma3nz_amean
1                   -0.6673099                   0.4222571
2                   -0.1604694                  -0.4704828
3                   -0.4741000                   0.5366185
4                   -0.2659146                  -0.1858470
5                    1.1372382                   0.1190452
  F0semitoneFrom27.5Hz_sma3nz_stddevNorm
1                            -0.01272255
2                            -0.18455482
3                             3.13545130
4                            -0.33707109
5                            -0.22149904
  F0semitoneFrom27.5Hz_sma3nz_percentile50.0 HNRdBACF_sma3nz_amean
1                                 0.08706357            -0.3489994
2                                -0.04038745             0.5741044
3                                -2.00237605            -1.1221022
4                                 1.71690887             0.5132584
5                                 0.28331605            -0.2707432
  slopeV500.1500_sma3nz_amean loudness_sma3_meanRisingSlope
1                  0.09406474                    -0.3101952
2                 -0.34319895                    -0.2268026
```

```
3                -0.38939617                      -0.2230488
4                 2.18205869                       1.1166997
5                 0.46953952                       0.7585175
  alphaRatioV_sma3nz_amean F0semitoneFrom27.5Hz_sma3nz_percentile20.0
1               0.0601328                                   0.12636406
2              -0.4186523                                   0.09343233
3              -1.1745944                                  -3.82428437
4               2.9566687                                   1.31635629
5               0.7545025                                   0.33433558
  F1amplitudeLogRelF0_sma3nz_stddevNorm
1                             0.5483013
2                            -0.1205928
3                             0.4802127
4                            -2.4176686
5                            -0.5542464

Clustering vector:
   [1] 1 1 1 2 5 2 1 2 5 5 1 1 2 5 1 1 2 3 2 2 1 2 2 2 2 5 5 2 1 5 2 2 1 2 2 3 2
  [38] 1 5 1 1 5 1 5 2 2 5 2 1 5 2 5 2 1 2 3 1 2 2 5 5 5 1 5 1 2 1 5 2 1 2 2 1 3
  [75] 2 5 5 1 2 3 1 1 5 2 3 5 1 5 1 1 5 2 2 2 5 1 2 2 1 2 1 1 2 5 5 1 2 1 1 1 2
 [112] 1 2 1 1 5 2 2 5 2 1 1 2 5 1 2 2 2 3 3 5 1 5 2 1 2 2 1 5 5 5 5 1 1 1 1 2 5
 [149] 1 1 2 1 2 1 1 2 1 1 1 1 2 5 1 1 2 2 2 2 2 1 1 2 1 5 2 5 1 5 3 5 2 5 2 1 5
 [186] 1 2 1 1 5 5 3 3 5 5 2 2 3 1 5 1 2 2 1 2 5 5 4 2 1 2 2 5 1 1 2 5 1 5 5 1 5
 [223] 1 2 2 1 2 3 5 1 1 2 5 1 5 2 2 2 1 2 5 1 2 1 5 1 5 1 5 1 2 1 1 1 2 2 1 1 2
 [260] 1 1 1 2 2 2 5 5 1 5 1 2 1 1 2 1 1 2 5 1 1 3 2 2 2 5 1 5 2 5 5 2 5 1 2 2 1
 [297] 2 1 1 1 1 1 3 2 3 2 2 1 2 1 1 1 1 1 5 2 2 5 2 2 1 5 2 5 1 2 1 1 1 1 5 1 1
 [334] 2 1 2 1 1 1 2 1 2 2 1 2 1 1 2 2 2 5 2 1 2 1 5 1 5 2 1 2 1 1 1 1 1 1 5 3 1
 [371] 5 2 3 1 2 1 1 1 3 1 2 1 5 2 1 5 2 1 1 2 1 2 1 5 1 1 2 2 2 2 1 1 1 1 5 2 5
 [408] 1 1 1 2 1 5 1 1 2 5 2 2 5 1 1 5 2 1 1 2 2 1 1 1 2 1 5 2 2 2 2 1 5 2 2 1 3
 [445] 5 1 2 1 1 2 1 1 1 2 2 1 2 3 1 2 1 2 2 5 2 1 5 2 1 2 2 2 3 1 1 5 1 2 5 1 5
 [482] 1 1 2 3 2 2 5 2 2 2 2 2 1 2 1 2 1 1 1 5 5 2 5 2 5 5 1 2 2 1 5 5 2 1 5 2 2
 [519] 1 1 1 1 5 1 2 1 1 1 2 2 1 2 2 1 2 1 1 2 5 1 5 1 1 2 5 5 1 1 2 5 5 5 2 2 5
 [556] 5 2 1 2 5 2 1 2 2 2 1 2 2 2 2 2 2 2 2 2 5 5 2 5 2 1 5 2 5 5 1 2 5 5 2 2 2
 [593] 5 1 1 2 1 5 1 5 2 5 1 1 5 2 5 2 5 5 5 1 5 2 2 5 1 5 1 2 5 1 2 5 5 1 2 2 2
 [630] 2 5 2 5 3 5 5 2 1 2 2 3 2 1 2 3 2 5 5 1 2 5 5 2 1 5 1 5 5 2 2 2 5 2 5 1 1
 [667] 5 2 1 2 2 5 5 5 2 2 5 2 1 5 5 2 1 5 5 1 2 5 5 5 5 1 5 1 1 5 2 5 2 1 5 5 1
 [704] 5 5 1 2 2 5 1 1 2 1 1 2 1 1 2 2 1 3 2 5 3 1 2 5 2 1 3 1 2 2 2 2 2 1 2 2 2
 [741] 2 1 2 3 2 3 5 2 2 2 3 2 5 1 2 1 1 5 5 1 2 2 2 1 2 2 5 5 5 5 2 2 5 5 2 1 1
 [778] 2 1 2 1 5 2 2 1 5 2 1 1 1 3 2 5 2 5 5 5 3 2 2 5 5 2 2 2 5 5 5 5 5 2 3 1 5
 [815] 2 1 1 5 1 2 5 2 2 2 5 5 1 2 1 5 2 5 2 5 2 1 2 2 2 2 1 1 2 5 2 1 5 1 2 5 5
 [852] 2 2 1 3 2 1 1 2 2 5 1 1 2 5 1 5 2 2 2 5 2 1 2 5 5 5 2 5 5 2 2 5 5 5 2 1 1
 [889] 5 2 2 5 2 5 1 2 5 2 1 5 2 2 1 2 5 2 2 2 2 5 2 5 1 5 2 5 2 1 1 1 1 5 1 5 2
 [926] 5 2 5 2 5 5 2 3 2 1 2 5 5 5 3 2 5 5 5 5 5 2 1 1 2 1 5 5 5 2 1 5 3 2 2 5 5
 [963] 2 1 5 5 2 2 5 5 2 5 2 1 2 1 1 2 2 2 5 2 3 5 2 5 2 5 5 2 2 2 5 5 5 5 1 5 2
[1000] 2 1 2 1 5 2 2 5 1 2 2 2 1 2 2 1 5 1 1 2 5 5 2 2 2 3 5 5 2 2 2 2 1 2 1 1 1
[1037] 1 2 1 2 5 2 1 2 1 2 2 1 2 1 1 2 1 1 5 2 2 5 3 2 5 5 5 2 1 1 1 2 1 2 2 3 1
[1074] 5 2 1 2 5 1 2 2 1 3 2 2 5 2 5 2 2 1 2 2 2 5 2 5 2 2 3 5 1 2 5 1 3 5 2 5 2
[1111] 5 2 2 1 2 2 2 2 2 2 5 1 1 5 2 5 2 2 2 5 2 1 1 1 2 5 2 2 2 5 5 2 3 1 1 1 5
[1148] 1 2 2 5 1 1 2 2 2 2 1 2 1 2 2 5 2 2 2 2 1 1 2 5 5 2 2 5 5 1 5 1 2 1 1 1 3
[1185] 1 2 2 2 2 5 2 1 1 2 2 2 3 1 2 5 2 2 5 1 2 2 1 1 1 5 2 2 2 2 3 2 2 5 2 5 5
[1222] 1 3 2 5 5 2 2 1 3 2 1 2 2 1 1 2 2 1 1 1 2 2 5 2 3 1 2 1 1

Within cluster sum of squares by cluster:
[1] 5815.796 4821.056 2521.809    0.000 6146.645
 (between_SS / total_SS =  38.2 %)
```

```
Available components:

[1] "cluster"      "centers"      "totss"        "withinss"     "tot.withinss"
[6] "betweenss"    "size"         "iter"         "ifault"
```

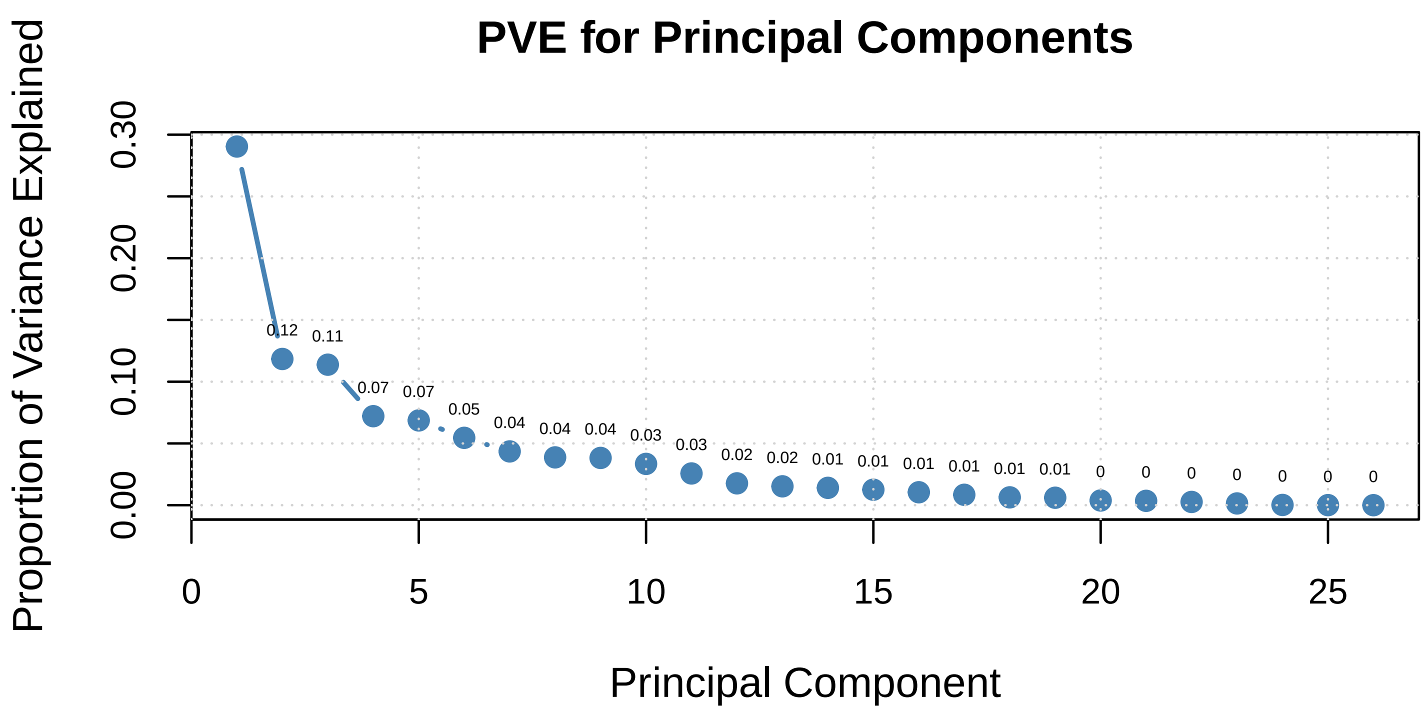
```
# assign modeled clusters to each data point
clustered_data <- data_imputed
clustered_data$Cluster <- as.factor(kmeans_result$cluster)

# visualize clusters
fviz_cluster(kmeans_result,
             data = clust_data_scaled,
             ellipse.type = "euclid",
             labelsize = 0,
             show.clust.cent = TRUE,
             ggtheme = theme_minimal()) +
  labs(title = "K-means Clustering (k = 5)", x = "PC1", y = "PC2")
```

```
Too few points to calculate an ellipse
```




```
# run pca analysis
pca_result <- prcomp(clust_data, scale. = TRUE)

# calculate proportion of variance explained
pve <- (pca_result$sdev)^2 / sum(pca_result$sdev^2)

# plot proportion of variance for principal components
plot(pve, type = "b", pch = 19, col = "steelblue", lwd = 2,
```

```r
     xlab = "Principal Component",
     ylab = "Proportion of Variance Explained",
     main = "PVE for Principal Components",
     cex.main = 1.2, cex.lab = 1.1, cex.axis = 0.9)

# add grid lines to graph
grid()

# label each point with exact variance value
text(x = 1:length(pve), y = pve,
     labels = round(pve, 2),
     pos = 3, cex = 0.4, col = "black")
```




```r
# print proportion of variance for PC1 and PC2
pve[1:2]
```

```
[1] 0.2904021 0.1183942
```

```r
pve[1]+pve[2]
```

```
[1] 0.4087963
```

```r
# create a data frame with cluster assignments and true labels
df <- data.frame(Cluster = clustered_data$Cluster, CryType = data_imputed$Reason)

# generate a contingency table: distribution of true labels within each cluster
```

```r
label_distribution <- table(df$Cluster, df$CryType)

# neat printed table
kable(label_distribution, caption = "Distribution of Cry Types Within Each Cluster")
```

Table 4: Distribution of Cry Types Within Each Cluster

| Diaper-Change | Fussy | Hungry | Pain | Tired |
|---:|---:|---:|---:|---:|
| 88 | 112 | 65 | 52 | 71 |
| 85 | 91 | 98 | 98 | 117 |
| 13 | 10 | 8 | 9 | 13 |
| 1 | 0 | 0 | 0 | 0 |
| 63 | 37 | 79 | 91 | 49 |

```r
# convert to proportions within each cluster
prop_distribution <- prop.table(label_distribution, margin = 1)
# for proportions
kable(round(prop_distribution, 2), caption = "Proportion of Cry Types Within Each Cluster")
```

Table 5: Proportion of Cry Types Within Each Cluster

| Diaper-Change | Fussy | Hungry | Pain | Tired |
|---:|---:|---:|---:|---:|
| 0.23 | 0.29 | 0.17 | 0.13 | 0.18 |
| 0.17 | 0.19 | 0.20 | 0.20 | 0.24 |
| 0.25 | 0.19 | 0.15 | 0.17 | 0.25 |
| 1.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 0.20 | 0.12 | 0.25 | 0.29 | 0.15 |

```r
# data frame with cluster assignments, reasons and frequency associated with each cluster/reason
↪  combo
cluster_counts <- df %>%
  group_by(Cluster, CryType) %>%
  summarise(Frequency = n(), .groups = 'drop')

# plot each reason against the cluster assignments
ggplot(cluster_counts, aes(x = CryType, y = Frequency, fill = CryType)) +
  geom_bar(stat = "identity", show.legend = FALSE) +
  facet_wrap(~ Cluster, ncol = 2) +
  labs(
    title = "Distribution of Cry Reasons Within Each Cluster",
    x = "Cry Reason",
    y = "Frequency"
  ) +
  theme_minimal(base_size = 12) +
  theme(
    axis.text.x = element_text(angle = 30, hjust = 1),
    strip.text = element_text(face = "bold")
  )
```

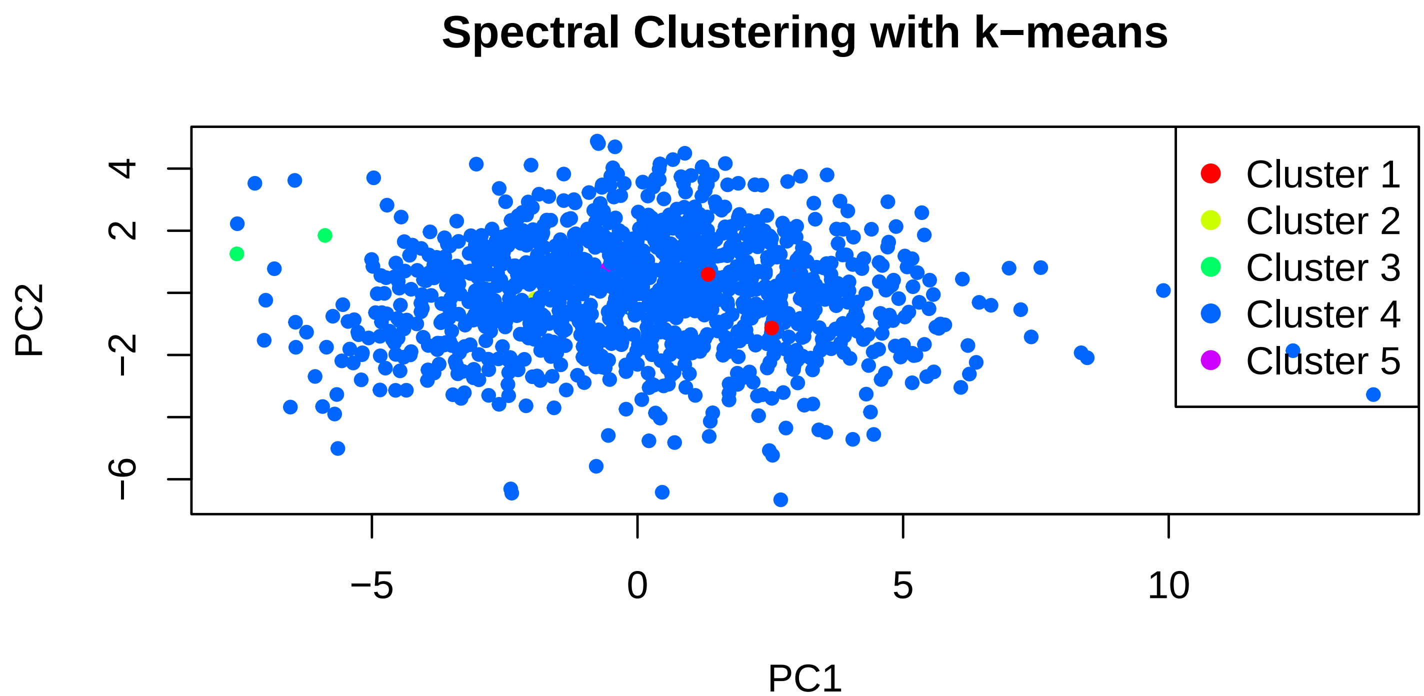

```
# dimensions
dim(clust_data)
```

```
[1] 1250   26
```

**Spectral Clustering**

```
# generate random data for clustering
set.seed(605794011)
k <- 5

# extract the first two principal components
PC1 <- pca_result$x[, 1]
PC2 <- pca_result$x[, 2]

# compute the similarity matrix
similarity_matrix <- exp(-dist(clust_data)^2)

# perform spectral decomposition
eigen_result <- eigen(similarity_matrix)

# extract the top-k eigenvectors
k_eigenvectors <- eigen_result$vectors[, 1:k]

# perform k-means clustering on the eigenvectors
cluster_assignments <- kmeans(k_eigenvectors, centers = k)$cluster

# visualize clusters
cluster_colors <- rainbow(k)
```

```r
plot(PC1, PC2, col = cluster_colors[cluster_assignments], pch = 19, cex = 0.7,
     main = "Spectral Clustering with k-means", xlab = "PC1", ylab = "PC2")
legend("topright", legend = paste("Cluster", 1:k), col = cluster_colors, pch = 19)
```




**Gaussian Mixture Models**

```r
df <- read.csv("full_data_cleaned_without_nas.csv")

# Identify all numeric columns
numeric_cols <- sapply(df, is.numeric)
numeric_col_names <- names(df)[numeric_cols]

# Exclude the non-numeric/irrelevant columns
cols_to_exclude <- c("newID", "Age", "Date", "Sample")
numeric_data <- df[, setdiff(numeric_col_names, cols_to_exclude)]

# Perform GMM
gmm <- Mclust(numeric_data)

# Get the cluster assignments
cluster_assignments <- gmm$classification
```

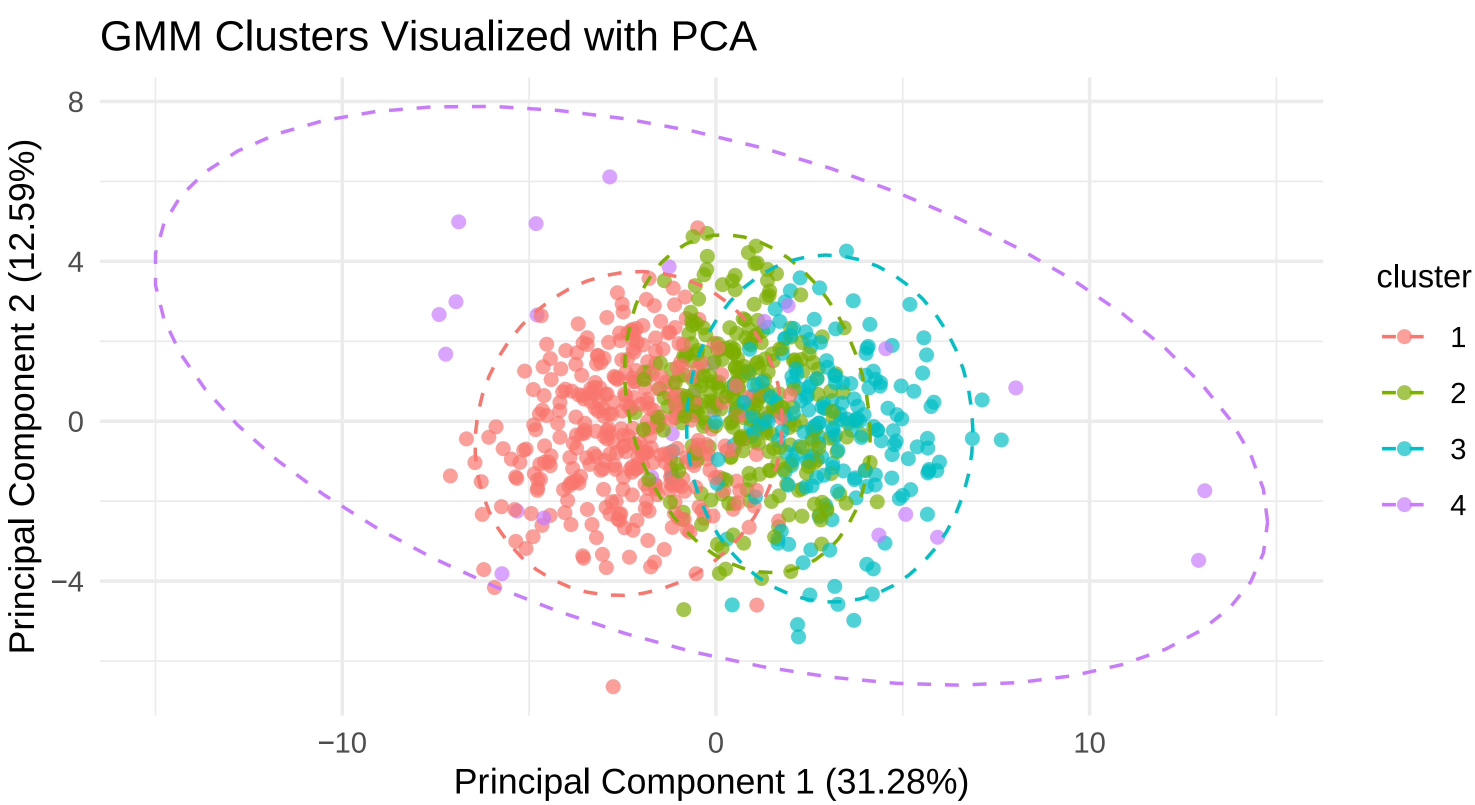
```r
# Perform PCA on the data used for GMM
pca_res <- prcomp(numeric_data, scale. = TRUE) # scale.=TRUE is important for PCA

# Create a data frame for plotting PCA results with cluster assignments
pca_data <- as.data.frame(pca_res$x)
```

```r
pca_data$cluster <- as.factor(cluster_assignments)
```

```r
# Plot the first two principal components, colored by cluster
table(cluster_assignments)
```

```
cluster_assignments
  1   2   3   4 
356 291 194  27 
```

```r
ggplot(pca_data, aes(x = PC1, y = PC2, color = cluster)) +
  geom_point(alpha = 0.7) +
  stat_ellipse(aes(group = cluster), type = "norm", linetype = 2) +
  labs(title = "GMM Clusters Visualized with PCA",
       x = paste0("Principal Component 1 (", round(summary(pca_res)$importance[2,1]*100, 2), "%)"),
       y = paste0("Principal Component 2 (", round(summary(pca_res)$importance[2,2]*100, 2), "%)"))
        ↪  +
  theme_minimal() +
  theme(legend.title = element_text(size = 10))
```




### Question 3: Supervised Learning

#### Regression Models

```r
data2$Reason <- as.factor(data$Reason) # factor data

set.seed(333) # set up training data
trainIndex <- createDataPartition(data2$Reason, p = 0.8, list = FALSE)
trainData <- data2[trainIndex, ]
testData <- data2[-trainIndex, ]

ctrl <- trainControl(method = "cv", number = 10, verboseIter = FALSE)

set.seed(333) # logistic model, just a test!
invisible(capture.output({
  suppressMessages({
    suppressWarnings({
      model_logit <- train(
        Reason ~ . - ID,
        data = trainData,
        method = "multinom",
        trControl = ctrl
      )
    })
  })
}))

model_logit$results
```

```
  decay  Accuracy     Kappa AccuracySD    KappaSD
1 0e+00 0.9914268 0.9892831 0.01531699 0.01914626
2 1e-04 1.0000000 1.0000000 0.00000000 0.00000000
3 1e-01 0.9942437 0.9928026 0.01002952 0.01253884
```

```r
head(data)
```

```
  newID                               ID        Reason Age Gender   Date
1     1 bfb4662ea7ea4b8468d74c7ad1909ef1 Diaper-Change  49 female 181002
2     4 3b09f1cad01fe3972282858c331f52d5 Diaper-Change  23 female 210717
3     5 e8f2d8b96f020af62e904e8e49445ce3 Diaper-Change  60   male 190606
4     6 6a82f817144649d0b8ff551570c6824e Diaper-Change  74   male 180711
5     9 8222356f4d4be372fb94488cdaabb075 Diaper-Change   8   male 180705
6    10 5ec09ae3e9fd6fb143bf92b431e182f1 Diaper-Change  81 female 190212
   Sample ParentFile shimmerLocaldB_sma3nz_stddevNorm
1  340074     diaper                        0.7027443
2 1079369     diaper                        0.6111611
3  526227     diaper                        1.3477150
4  224920     diaper                        0.5269586
5  201998     diaper                        1.1081220
6  458364     diaper                        0.8726283
  loudness_sma3_percentile20.0 F3amplitudeLogRelF0_sma3nz_amean
1                   0.11481330                       -147.90350
2                   0.07673505                        -74.69855
3                   0.49998700                        -53.44516
4                   0.40500970                       -108.06370
5                   0.28399970                        -69.01035
6                   0.43889410                        -49.47916
```

| | loudness_sma3_percentile50.0 | loudness_sma3_amean |
|---|---|---|
| 1 | 0.1428274 | 0.4213910 |
| 2 | 0.4041929 | 0.4412344 |
| 3 | 1.6900650 | 1.6746600 |
| 4 | 0.6827049 | 0.7537612 |
| 5 | 2.6455030 | 2.2942330 |
| 6 | 1.4687040 | 1.3787450 |

| | F2amplitudeLogRelF0_sma3nz_amean | F3amplitudeLogRelF0_sma3nz_stddevNorm |
|---|---|---|
| 1 | -146.46640 | -0.5471651 |
| 2 | -72.39424 | -1.3117100 |
| 3 | -47.35921 | -1.4569950 |
| 4 | -111.10530 | -0.9248785 |
| 5 | -66.83566 | -1.2720410 |
| 6 | -48.83880 | -1.7023990 |

| | MeanUnvoicedSegmentLength | F2amplitudeLogRelF0_sma3nz_stddevNorm |
|---|---|---|
| 1 | 0.2428571 | -0.5677297 |
| 2 | 0.3620000 | -1.3779880 |
| 3 | 0.1700000 | -1.7414370 |
| 4 | 0.2141667 | -0.8698995 |
| 5 | 0.1577778 | -1.3362150 |
| 6 | 0.1614286 | -1.7253130 |

| | F0semitoneFrom27.5Hz_sma3nz_percentile80.0 | F1amplitudeLogRelF0_sma3nz_amean |
|---|---|---|
| 1 | 46.81261 | -152.73810 |
| 2 | 46.94024 | -76.52715 |
| 3 | 50.69794 | -50.17403 |
| 4 | 44.43988 | -131.68280 |
| 5 | 47.34345 | -73.17527 |
| 6 | 48.19924 | -51.49702 |

| | F0semitoneFrom27.5Hz_sma3nz_pctlrange0.2 | alphaRatioV_sma3nz_stddevNorm |
|---|---|---|
| 1 | 5.167824 | -2.190032 |
| 2 | 6.519093 | 1.314629 |
| 3 | 4.542534 | -3.228497 |
| 4 | 1.203712 | 7.815800 |
| 5 | 6.009083 | 1.168851 |
| 6 | 3.712673 | 2.269837 |

| | StddevUnvoicedSegmentLength | loudness_sma3_stddevNorm |
|---|---|---|
| 1 | 0.25220260 | 1.2175340 |
| 2 | 0.30472280 | 0.8059498 |
| 3 | 0.10832050 | 0.6468157 |
| 4 | 0.19750350 | 0.5271363 |
| 5 | 0.12335840 | 0.5847681 |
| 6 | 0.08407965 | 0.5834538 |

| | loudness_sma3_percentile80.0 | shimmerLocaldB_sma3nz_amean |
|---|---|---|
| 1 | 0.9868522 | 1.0691180 |
| 2 | 0.8503428 | 1.0793920 |
| 3 | 2.5423420 | 0.5166118 |
| 4 | 1.0504700 | 1.0174220 |
| 5 | 3.5476430 | 0.7986757 |
| 6 | 1.9161340 | 0.8547453 |

| | F0semitoneFrom27.5Hz_sma3nz_stddevNorm |
|---|---|
| 1 | 0.06150837 |
| 2 | 0.09242810 |
| 3 | 0.09557015 |
| 4 | 0.09890169 |
| 5 | 0.12676860 |

```
6                              0.06160650
  F0semitoneFrom27.5Hz_sma3nz_percentile50.0 HNRdBACF_sma3nz_amean
1                                   44.66841             7.481863
2                                   44.59288             7.745597
3                                   47.33990            13.455450
4                                   43.78660             5.959348
5                                   44.88856             8.342858
6                                   46.69179             8.056822
  slopeV500.1500_sma3nz_amean loudness_sma3_meanRisingSlope
1                 0.008295592                      8.998878
2                 0.021390640                      2.926372
3                 0.004193363                     18.998730
4                 0.005033952                      4.795324
5                 0.012155850                     23.805280
6                 0.012637170                      9.674027
  alphaRatioV_sma3nz_amean F0semitoneFrom27.5Hz_sma3nz_percentile20.0
1               -3.4233770                                   41.64479
2                5.9832670                                   40.42115
3               -3.3107370                                   46.15540
4                0.8115537                                   43.23617
5                4.8444340                                   41.33437
6                3.6916260                                   44.48657
  F1amplitudeLogRelF0_sma3nz_stddevNorm
1                            -0.5381386
2                            -1.3479890
3                            -1.9113570
4                            -0.7263191
5                            -1.3526220
6                            -1.7327520
```

#### Logistic Regression

```r
# preferred model
data$Reason <- as.factor(data$Reason)
data$Gender <- as.factor(data$Gender)

data_clean <- data %>%
  select(-newID, -ID, -Date, -Sample) # remove categorical data

acoustic_features <- data_clean %>%
  select_if(is.numeric) %>%
  scale() %>%
  as.data.frame() # get the acoustic features

data_model <- bind_cols(acoustic_features, data %>% select(Reason, Gender, Age))
```

```
New names:
* `Age` -> `Age...1`
* `Age` -> `Age...29`
```

```r
set.seed(123)
logit_model <- multinom(Reason ~ ., data = data_model) # logstic model creation
```

```
# weights:  150 (116 variable)
initial  value 1396.992108
iter  10 value 1341.955910
iter  20 value 1320.397761
iter  30 value 1307.343988
iter  40 value 1303.640738
iter  50 value 1301.603012
iter  60 value 1300.152200
iter  70 value 1299.670833
iter  80 value 1299.431509
iter  90 value 1299.130402
iter 100 value 1298.864561
final  value 1298.864561
stopped after 100 iterations
```

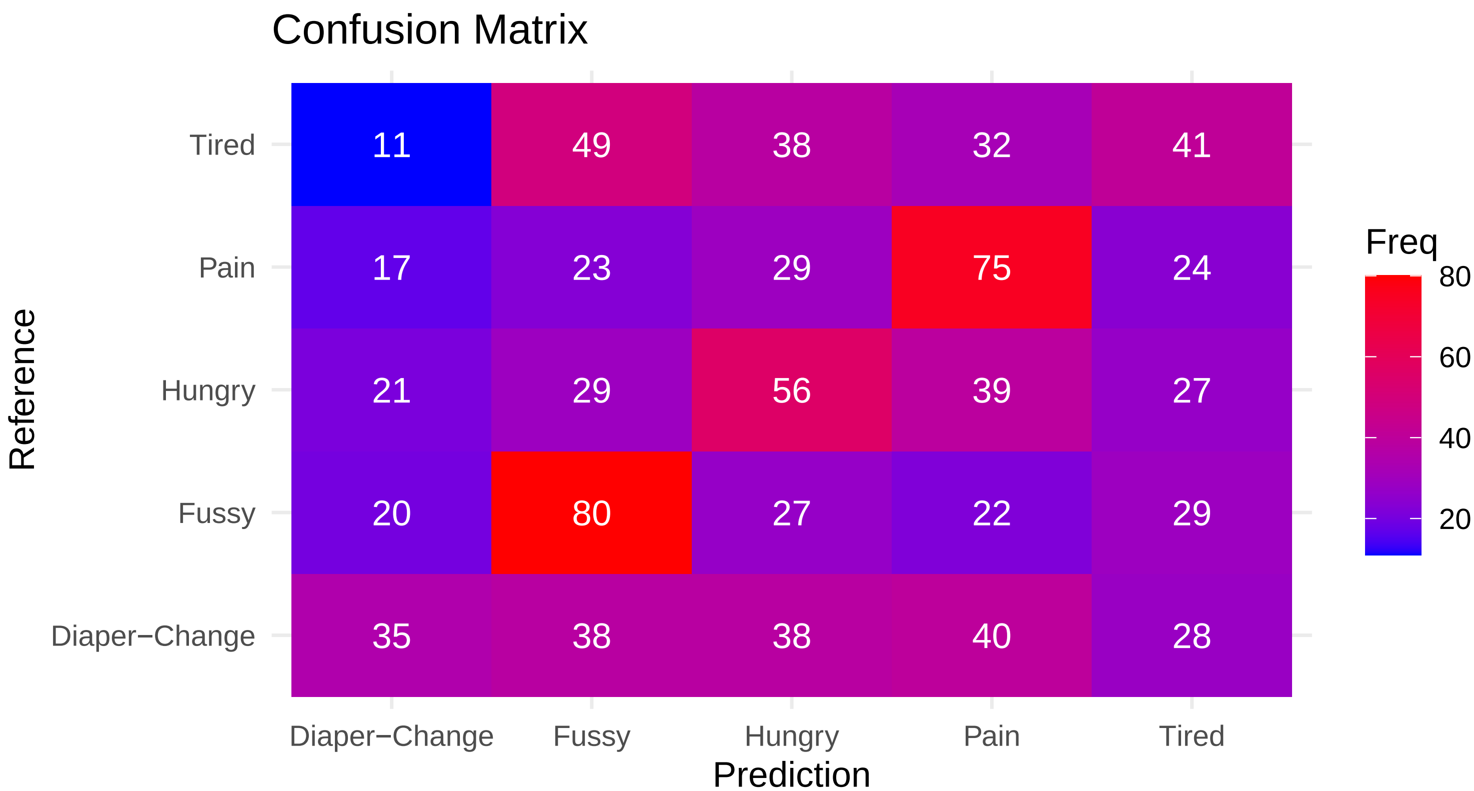
```r
preds <- predict(logit_model, newdata = data_model)

conf_mat <- confusionMatrix(preds, data_model$Reason) # produce confusion matrix

print(conf_mat$overall['Accuracy'])
```

```
 Accuracy
0.3306452
```

```r
print(conf_mat$table)
```

```
               Reference
Prediction      Diaper-Change Fussy Hungry Pain Tired
  Diaper-Change            35    20     21   17    11
  Fussy                    38    80     29   23    49
  Hungry                   38    27     56   29    38
  Pain                     40    22     39   75    32
  Tired                    28    29     27   24    41
```

```r
conf_df <- as.data.frame(conf_mat$table) # print the matrix
ggplot(conf_df, aes(Prediction, Reference, fill = Freq)) +
  geom_tile() +
  geom_text(aes(label = Freq), color = "white", size = 4) +
  scale_fill_gradient(low = "blue", high = "red") +
  theme_minimal() +
  labs(title = "Confusion Matrix")
```




**Linear Regression**

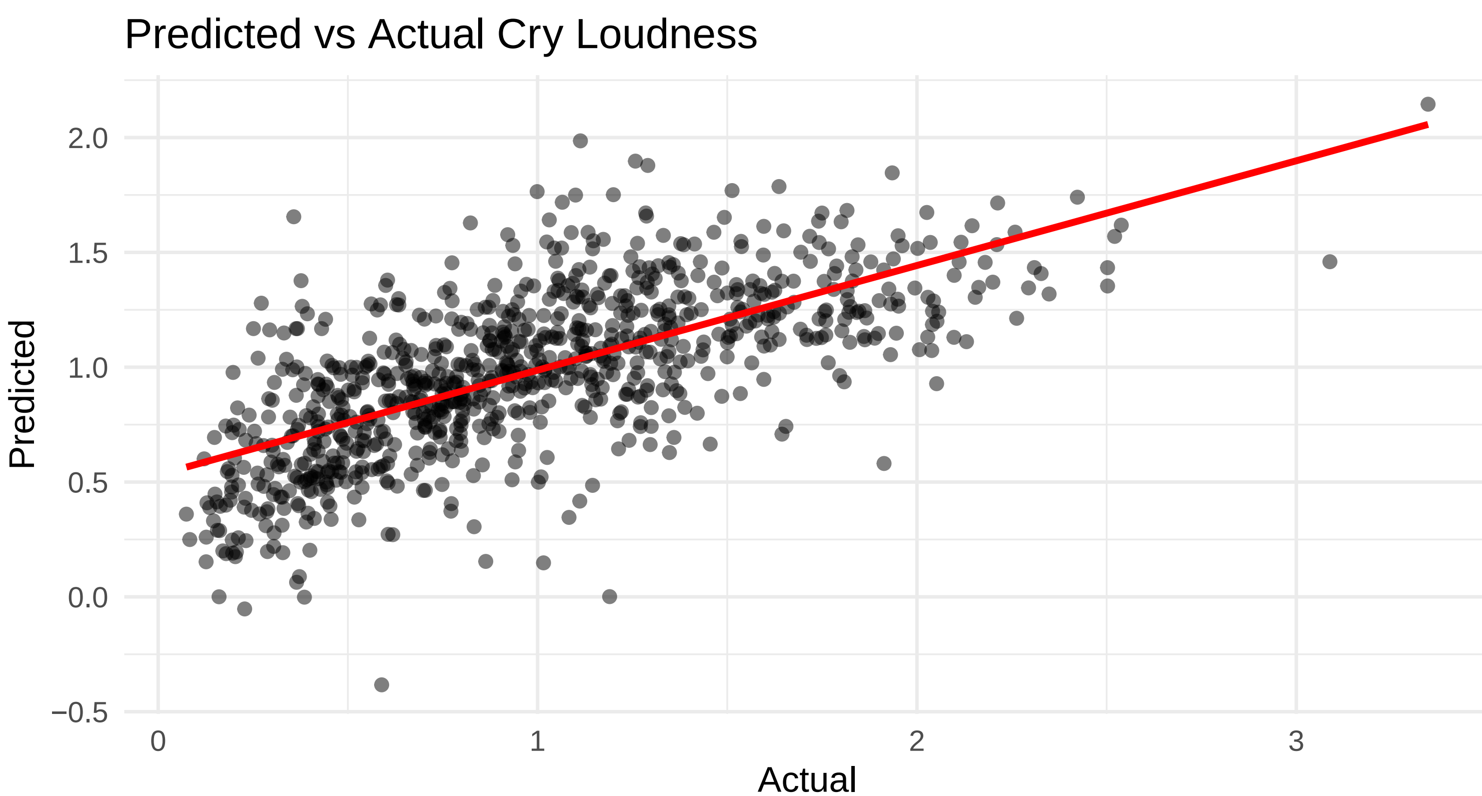
```
data_lm <- data %>% # linear model data
  select(loudness_sma3_amean, Age, Gender,
         starts_with("shimmer"),
         starts_with("F0"),
         starts_with("alpha"),
         starts_with("F1"),
         starts_with("F2"))

data_lm$Gender <- as.factor(data_lm$Gender)

lm_model <- lm(loudness_sma3_amean ~ ., data = data_lm) # set up model

summary(lm_model) # summarize
```

```
Call:
lm(formula = loudness_sma3_amean ~ ., data = data_lm)

Residuals:
     Min       1Q   Median       3Q      Max
-1.29770 -0.24596 -0.05427  0.20554  1.62916

Coefficients: (1 not defined because of singularities)
                                             Estimate Std. Error t value
(Intercept)                                 1.110e+00  2.369e-01   4.687
Age                                         1.682e-06  1.950e-05   0.086
Gendermale                                 -1.511e-03  2.695e-02  -0.056
```

```
shimmerLocaldB_sma3nz_stddevNorm           3.014e-01  6.790e-02   4.438
shimmerLocaldB_sma3nz_amean                7.408e-02  4.955e-02   1.495
F0semitoneFrom27.5Hz_sma3nz_percentile80.0 -3.633e-03  5.909e-03  -0.615
F0semitoneFrom27.5Hz_sma3nz_pctlrange0.2    4.401e-03  3.952e-03   1.114
F0semitoneFrom27.5Hz_sma3nz_stddevNorm      9.466e-02  3.060e-01   0.309
F0semitoneFrom27.5Hz_sma3nz_percentile50.0  2.422e-03  5.418e-03   0.447
F0semitoneFrom27.5Hz_sma3nz_percentile20.0         NA         NA      NA
alphaRatioV_sma3nz_stddevNorm              7.477e-05  1.670e-04   0.448
alphaRatioV_sma3nz_amean                   2.075e-02  2.115e-03   9.814
F1amplitudeLogRelF0_sma3nz_amean          -3.856e-04  1.561e-03  -0.247
F1amplitudeLogRelF0_sma3nz_stddevNorm     -1.124e-01  6.117e-02  -1.838
F2amplitudeLogRelF0_sma3nz_amean           5.896e-03  1.350e-03   4.368
F2amplitudeLogRelF0_sma3nz_stddevNorm      1.380e-02  4.413e-03   3.128
                                          Pr(>|t|)
(Intercept)                               3.23e-06 ***
Age                                        0.93127
Gendermale                                 0.95530
shimmerLocaldB_sma3nz_stddevNorm          1.03e-05 ***
shimmerLocaldB_sma3nz_amean                0.13526
F0semitoneFrom27.5Hz_sma3nz_percentile80.0  0.53884
F0semitoneFrom27.5Hz_sma3nz_pctlrange0.2    0.26570
F0semitoneFrom27.5Hz_sma3nz_stddevNorm      0.75713
F0semitoneFrom27.5Hz_sma3nz_percentile50.0  0.65499
F0semitoneFrom27.5Hz_sma3nz_percentile20.0       NA
alphaRatioV_sma3nz_stddevNorm              0.65444
alphaRatioV_sma3nz_amean                   < 2e-16 ***
F1amplitudeLogRelF0_sma3nz_amean           0.80494
F1amplitudeLogRelF0_sma3nz_stddevNorm      0.06646 .
F2amplitudeLogRelF0_sma3nz_amean          1.41e-05 ***
F2amplitudeLogRelF0_sma3nz_stddevNorm      0.00182 **
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.393 on 853 degrees of freedom
Multiple R-squared:  0.4559,    Adjusted R-squared:  0.447
F-statistic: 51.05 on 14 and 853 DF,  p-value: < 2.2e-16
```

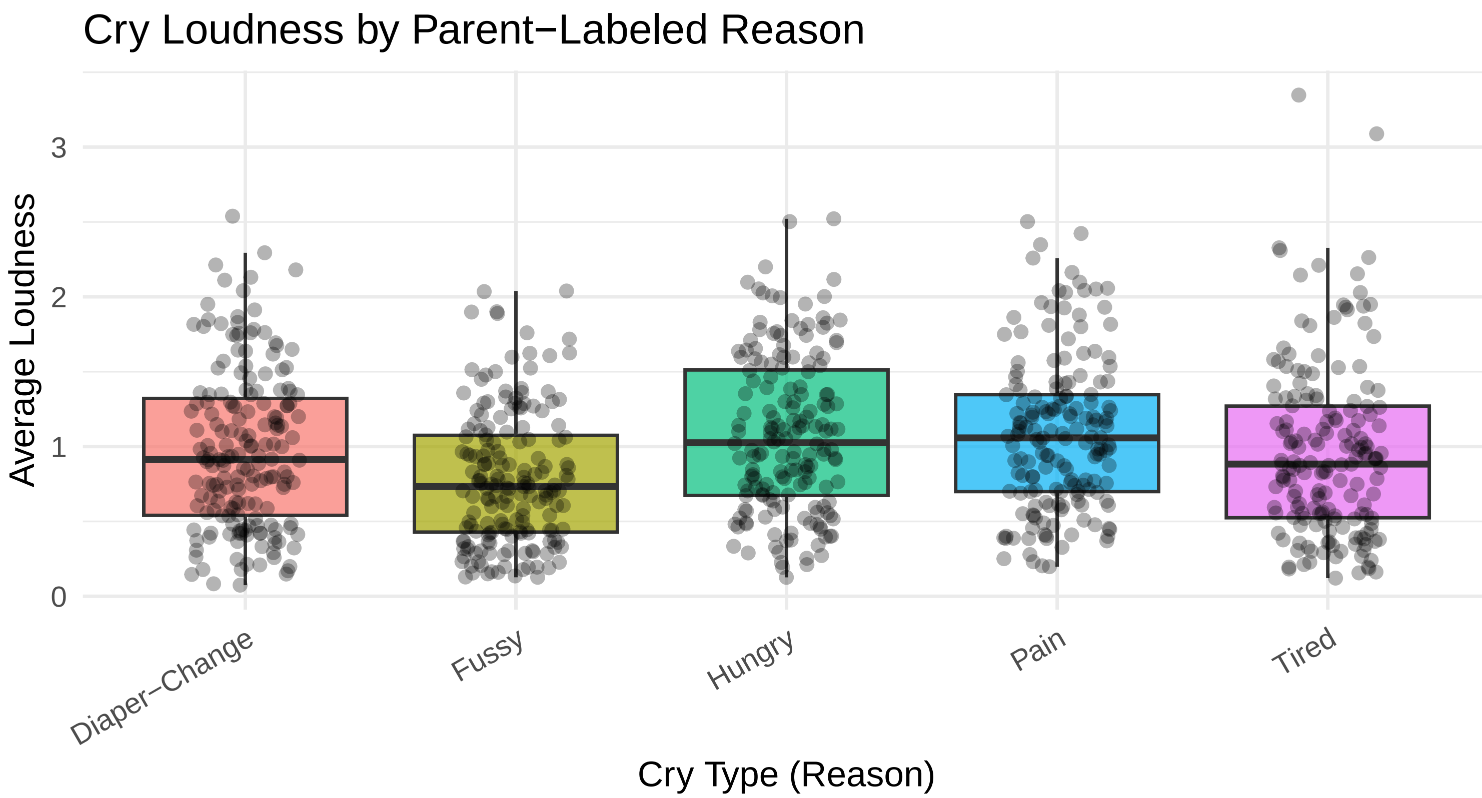
```r
data_lm$Predicted <- predict(lm_model, newdata = data_lm)

# plot the model
ggplot(data_lm, aes(x = loudness_sma3_amean, y = Predicted)) +
  geom_point(alpha = 0.5) +
  geom_smooth(method = "lm", se = FALSE, color = "red") +
  theme_minimal() +
  labs(title = "Predicted vs Actual Cry Loudness",
       x = "Actual",
       y = "Predicted")
```

```
`geom_smooth()` using formula = 'y ~ x'
```




```r
# just a simple plot for more linear regression showcase
ggplot(data, aes(x = Reason, y = loudness_sma3_amean, fill = Reason)) +
  geom_boxplot(alpha = 0.7, outlier.shape = NA) +
  geom_jitter(width = 0.2, alpha = 0.3, color = "black") +
  theme_minimal() +
  labs(
    title = "Cry Loudness by Parent-Labeled Reason",
    x = "Cry Type (Reason)",
    y = "Average Loudness"
  ) +
  theme(axis.text.x = element_text(angle = 30, hjust = 1)) +
  guides(fill = FALSE)
```

```
Warning: The `<scale>` argument of `guides()` cannot be `FALSE`. Use "none" instead as
of ggplot2 3.3.4.
```




**Non-Linear Supervised Learning Models**

```
# loading incomplete and complete data into R
data_with_nas <- read.csv("full_data_cleaned_include_nas.csv")
data_complete <- read.csv("full_data_cleaned_without_nas.csv")

# removing columns (newID, ID, Date, Sample, ParentFile)
rf_with_nas <- read.csv("full_data_cleaned_include_nas.csv")[, -c(1, 2, 6:8)]
rf_complete <- read.csv("full_data_cleaned_without_nas.csv")[, -c(1, 2, 4:8)]
rf_with_nas$Reason <- as.factor(rf_with_nas$Reason)
rf_complete$Reason <- as.factor(rf_complete$Reason)
```

**Random Forest**

```
# set seed for reproducibility
set.seed(605794011)

# train/test split
train_index <- createDataPartition(rf_complete$Reason, p = 0.8, list = FALSE)
train_complete <- rf_complete[train_index, ]
test_complete <- rf_complete[-train_index, ]

# fit random forest model
randomforest_complete <- randomForest(Reason ~ ., data = train_complete, importance = TRUE)

# predictions and evaluation of accuracy
preds_complete <- predict(randomforest_complete, test_complete)
```

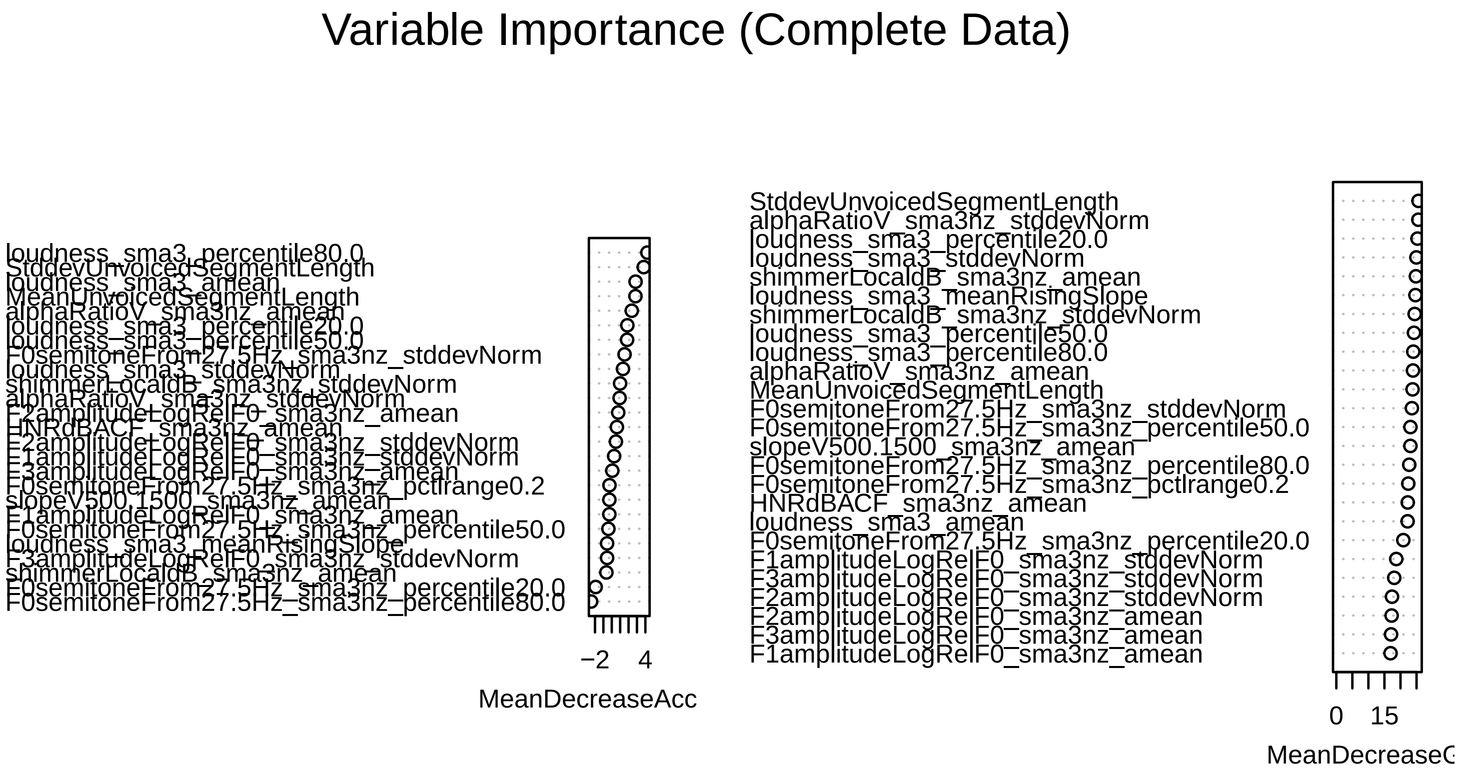
```r
conf_matrix_complete <- confusionMatrix(preds_complete, test_complete$Reason)
accuracy_complete <- conf_matrix_complete$overall['Accuracy']

# show results
print(conf_matrix_complete)
```

```
Confusion Matrix and Statistics

               Reference
Prediction       Diaper-Change Fussy Hungry Pain Tired
  Diaper-Change             10     3      6    5     5
  Fussy                      6    15      9    5     8
  Hungry                     5     6     10    8     8
  Pain                      11     3      5   12     8
  Tired                      3     8      4    3     5

Overall Statistics

               Accuracy : 0.3041
                 95% CI : (0.2362, 0.3789)
    No Information Rate : 0.2047
    P-Value [Acc > NIR] : 0.001373

                  Kappa : 0.1302

 Mcnemar's Test P-Value : 0.509556

Statistics by Class:

                     Class: Diaper-Change Class: Fussy Class: Hungry
Sensitivity                       0.28571      0.42857       0.29412
Specificity                       0.86029      0.79412       0.80292
Pos Pred Value                    0.34483      0.34884       0.27027
Neg Pred Value                    0.82394      0.84375       0.82090
Prevalence                        0.20468      0.20468       0.19883
Detection Rate                    0.05848      0.08772       0.05848
Detection Prevalence              0.16959      0.25146       0.21637
Balanced Accuracy                 0.57300      0.61134       0.54852
                     Class: Pain Class: Tired
Sensitivity              0.36364      0.14706
Specificity              0.80435      0.86861
Pos Pred Value           0.30769      0.21739
Neg Pred Value           0.84091      0.80405
Prevalence               0.19298      0.19883
Detection Rate           0.07018      0.02924
Detection Prevalence     0.22807      0.13450
Balanced Accuracy        0.58399      0.50784
```

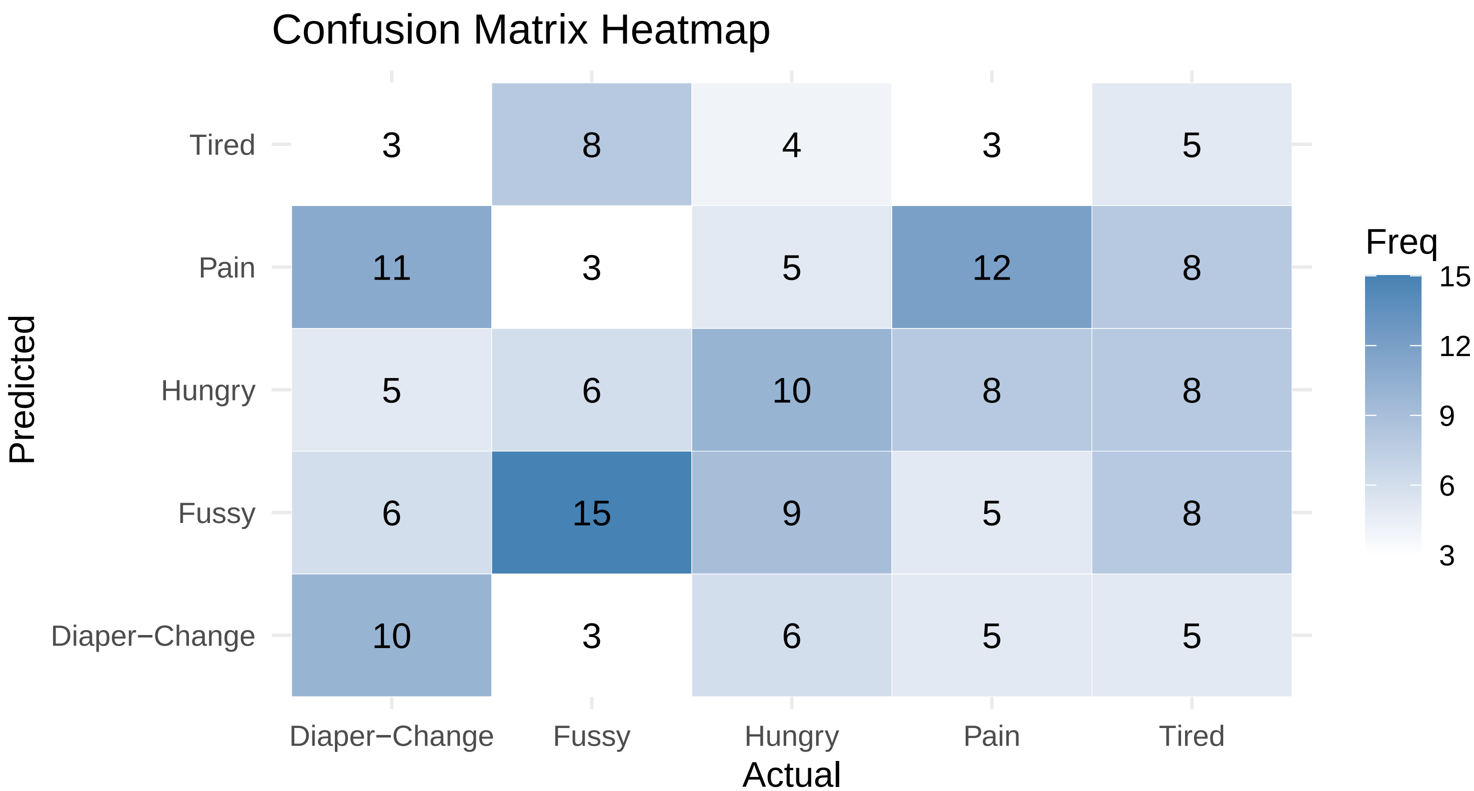
```r
print(accuracy_complete)
```

```
 Accuracy
0.3040936
```

```r
varImpPlot(randomforest_complete, main = "Variable Importance (Complete Data)", cex = 0.7)
```




```r
# creating a confusion matrix heatmap (pretty)
cm_df <- as.data.frame(conf_matrix_complete$table)
ggplot(cm_df, aes(x = Reference, y = Prediction)) +
  geom_tile(aes(fill = Freq), color = "white") +
  geom_text(aes(label = Freq), size = 4) +
  scale_fill_gradient(low = "white", high = "steelblue") +
  theme_minimal() +
  labs(title = "Confusion Matrix Heatmap", x = "Actual", y = "Predicted")
```




**Random Forest w/ mice imputation**

```
# create method vector for mice
methods <- make.method(rf_with_nas)
rf_with_nas$Gender[rf_with_nas$Gender == "MULT-REDCAP-GENDER"] <- NA
rf_with_nas$Gender <- as.factor(rf_with_nas$Gender)
init <- mice(rf_with_nas, maxit = 0)
methods <- init$method
methods["Reason"] <- ""
methods["Gender"] <- "logreg"  # or "polyreg" if >2 levels

# impute missing values using mice
imputed_data <- mice(rf_with_nas, m = 1, method = methods, seed = 605794011)
```

```
 iter imp variable
  1   1  Age  Gender
  2   1  Age  Gender
  3   1  Age  Gender
  4   1  Age  Gender
  5   1  Age  Gender
```

```
Warning: Number of logged events: 10
```

```
data_imputed <- complete(imputed_data, action = 1)

# ensure target and gender are factors
data_imputed$Reason <- as.factor(data_imputed$Reason)
```

```r
data_imputed$Gender <- as.factor(data_imputed$Gender)

# set seed for reproducibility
set.seed(605794011)

# train/test split
train_index2 <- createDataPartition(data_imputed$Reason, p = 0.8, list = FALSE)
train_imputed <- data_imputed[train_index2, ]
test_imputed <- data_imputed[-train_index2, ]

# fit random forest model
rf_imputed <- randomForest(Reason ~ ., data = train_imputed, importance = TRUE)

# predictions and evaluations of accuracy
preds_imputed <- predict(rf_imputed, test_imputed)
conf_matrix_imputed <- confusionMatrix(preds_imputed, test_imputed$Reason)
accuracy_imputed <- conf_matrix_imputed$overall['Accuracy']

# show results
print(conf_matrix_imputed)
```

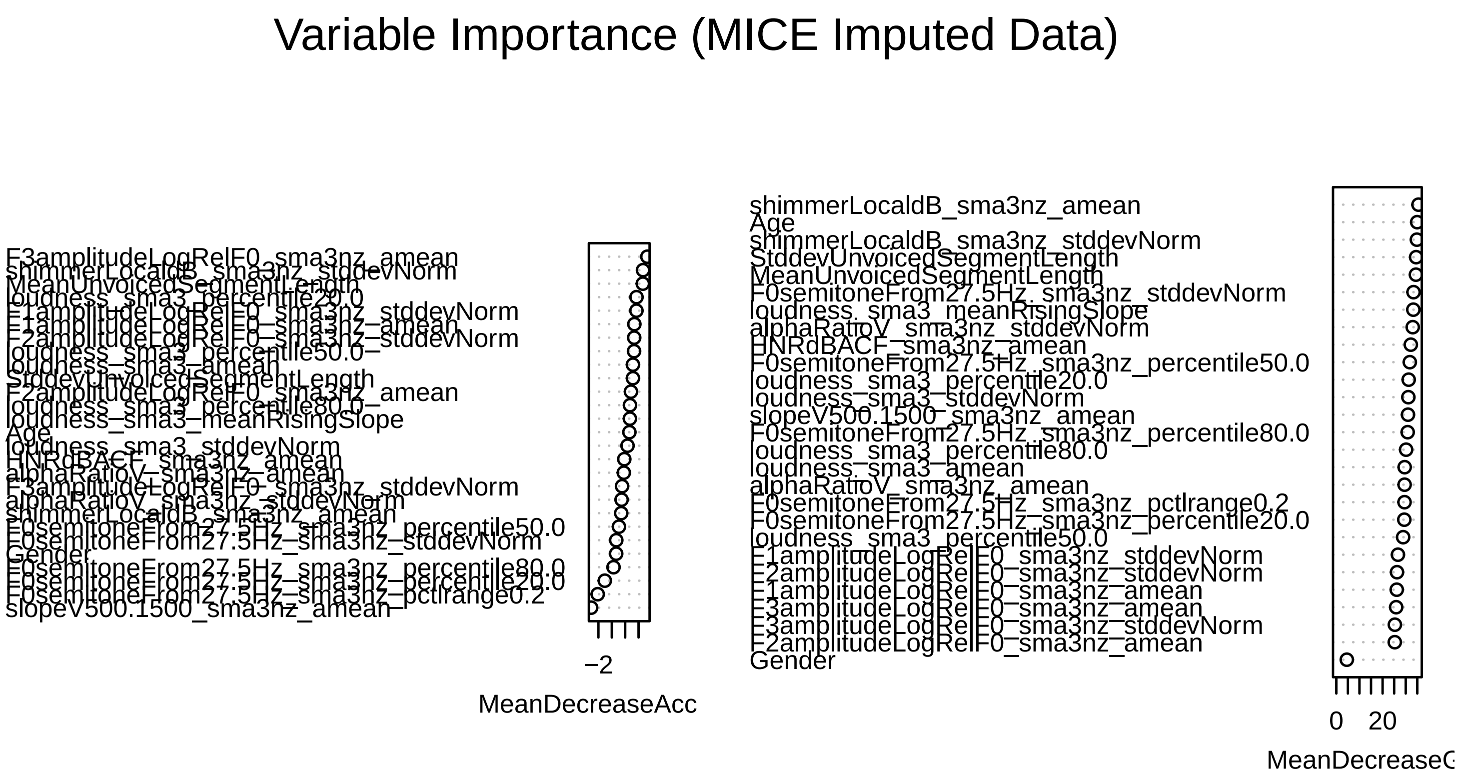
```
Confusion Matrix and Statistics

               Reference
Prediction      Diaper-Change Fussy Hungry Pain Tired
  Diaper-Change            10     8      5   11     8
  Fussy                    15    12     11    6    10
  Hungry                    8    13     12   12     7
  Pain                      7     6     12   14     9
  Tired                    10    11     10    7    16

Overall Statistics

               Accuracy : 0.256
                 95% CI : (0.2031, 0.3148)
    No Information Rate : 0.2
    P-Value [Acc > NIR] : 0.01852

                  Kappa : 0.07

 Mcnemar's Test P-Value : 0.89596

Statistics by Class:

                     Class: Diaper-Change Class: Fussy Class: Hungry
Sensitivity                        0.2000       0.2400        0.2400
Specificity                        0.8400       0.7900        0.8000
Pos Pred Value                     0.2381       0.2222        0.2308
Neg Pred Value                     0.8077       0.8061        0.8081
Prevalence                         0.2000       0.2000        0.2000
Detection Rate                     0.0400       0.0480        0.0480
Detection Prevalence               0.1680       0.2160        0.2080
Balanced Accuracy                  0.5200       0.5150        0.5200
                     Class: Pain Class: Tired
```

```
Sensitivity              0.2800      0.3200
Specificity              0.8300      0.8100
Pos Pred Value           0.2917      0.2963
Neg Pred Value           0.8218      0.8265
Prevalence               0.2000      0.2000
Detection Rate           0.0560      0.0640
Detection Prevalence     0.1920      0.2160
Balanced Accuracy        0.5550      0.5650
```

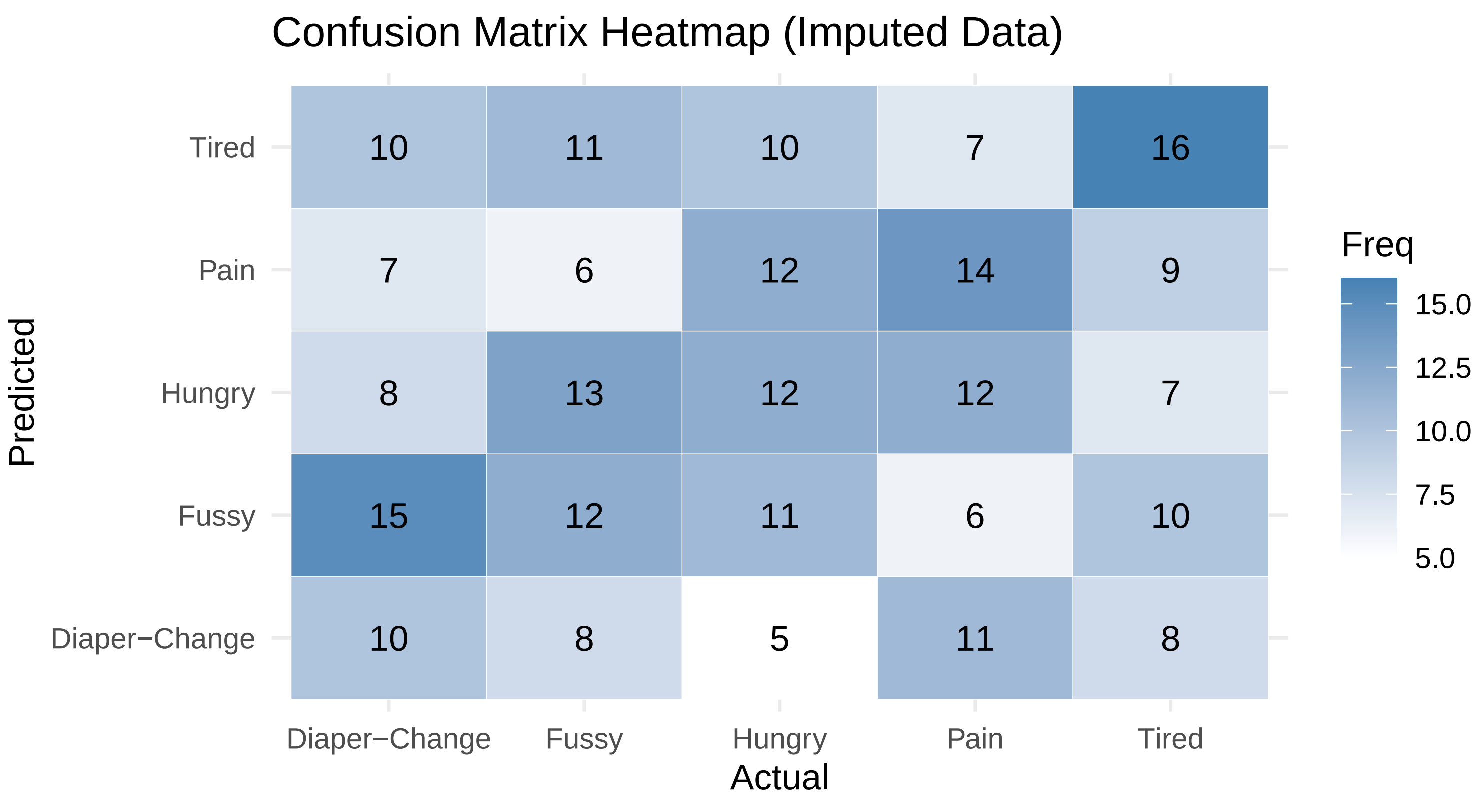
```r
print(accuracy_imputed)
```

```
Accuracy
   0.256
```

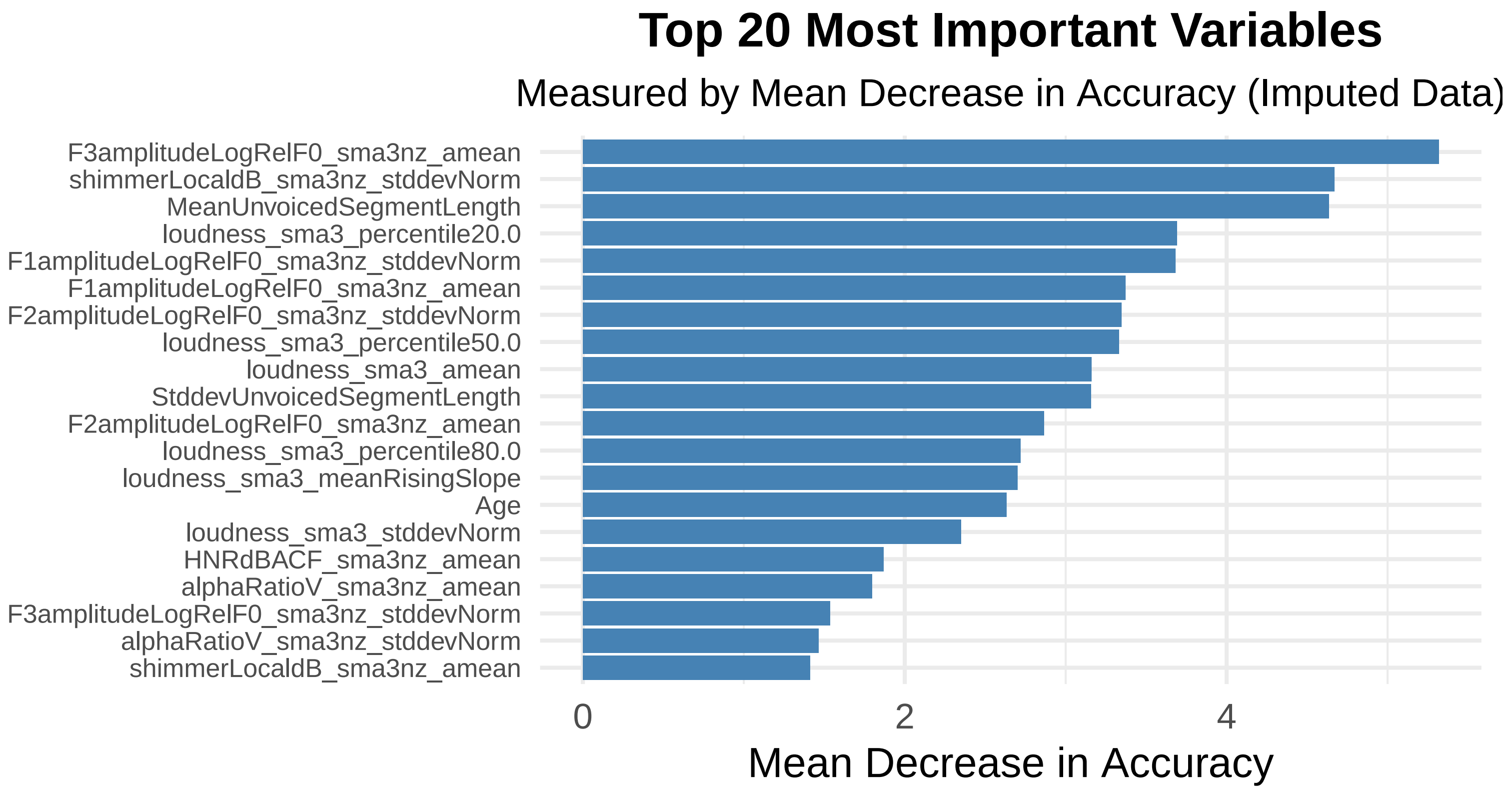
```r
varImpPlot(rf_imputed, main = "Variable Importance (MICE Imputed Data)", cex = 0.7)
```




```r
# creating a confusion matrix heatmap (pretty)
cm_df <- as.data.frame(conf_matrix_imputed$table)
ggplot(cm_df, aes(x = Reference, y = Prediction)) +
  geom_tile(aes(fill = Freq), color = "white") +
  geom_text(aes(label = Freq), size = 4) +
  scale_fill_gradient(low = "white", high = "steelblue") +
  theme_minimal() +
  labs(title = "Confusion Matrix Heatmap (Imputed Data)", x = "Actual", y = "Predicted")
```




```r
# extract variable importance
var_imp <- importance(rf_imputed, type = 1)  # MeanDecreaseAccuracy
var_imp_df <- as.data.frame(var_imp)
colnames(var_imp_df) <- make.names(colnames(var_imp_df))  # Ensure clean column names
var_imp_df$Variable <- rownames(var_imp_df)

# select top 20 variables
top_n <- 20
var_imp_df <- as_tibble(var_imp_df) %>%
  arrange(desc(MeanDecreaseAccuracy)) %>%
  dplyr::slice(1:top_n)

# create pretty plot for variable importance
ggplot(var_imp_df, aes(x = reorder(Variable, MeanDecreaseAccuracy),
                       y = MeanDecreaseAccuracy)) +
  geom_col(fill = "#4682B4") +
  coord_flip() +
  theme_minimal(base_size = 13) +
  labs(title = "Top 20 Most Important Variables",
       subtitle = "Measured by Mean Decrease in Accuracy (Imputed Data)",
       x = NULL,
       y = "Mean Decrease in Accuracy") +
  theme(
    plot.title = element_text(hjust = 0.5, face = "bold", size = 15),
    plot.subtitle = element_text(hjust = 0.5, size = 12),
    axis.text.y = element_text(size = 8),
    axis.text.x = element_text(size = 11)
  )
```




**Random Forest w/ subset of features**

```
# subset of variables from variable importance
rf_with_nas <- rf_with_nas[, c("Reason", "loudness_sma3_percentile50.0",
↪  "loudness_sma3_stddevNorm", "F2amplitudeLogRelF0_sma3nz_stddevNorm",
↪  "StddevUnvoicedSegmentLength", "loudness_sma3_percentile20.0",
↪  "F2amplitudeLogRelF0_sma3nz_amean", "MeanUnvoicedSegmentLength", "loudness_sma3_amean",
↪  "loudness_sma3_percentile80.0", "F1amplitudeLogRelF0_sma3nz_stddevNorm")]

# impute missing values using mice
imputed_data <- mice(rf_with_nas, m = 1, method = "pmm", seed = 605794011)
```

```
 iter imp variable
  1   1
  2   1
  3   1
  4   1
  5   1
```

```
data_imputed <- complete(imputed_data, action = 1)

# ensure target and gender are factors
data_imputed$Reason <- as.factor(data_imputed$Reason)

# set seed for reproducibility
set.seed(605794011)
```

```r
# train/test split
train_index2 <- createDataPartition(data_imputed$Reason, p = 0.8, list = FALSE)
train_imputed <- data_imputed[train_index2, ]
test_imputed <- data_imputed[-train_index2, ]

# fit random forest model with selected variables
rf_imputed <- randomForest(Reason ~ ., data = train_imputed, importance = TRUE)

# predictions and evaluations of accuracy
preds_imputed <- predict(rf_imputed, test_imputed)
conf_matrix_imputed <- confusionMatrix(preds_imputed, test_imputed$Reason)
accuracy_imputed <- conf_matrix_imputed$overall['Accuracy']

# show results
print(conf_matrix_imputed)
```

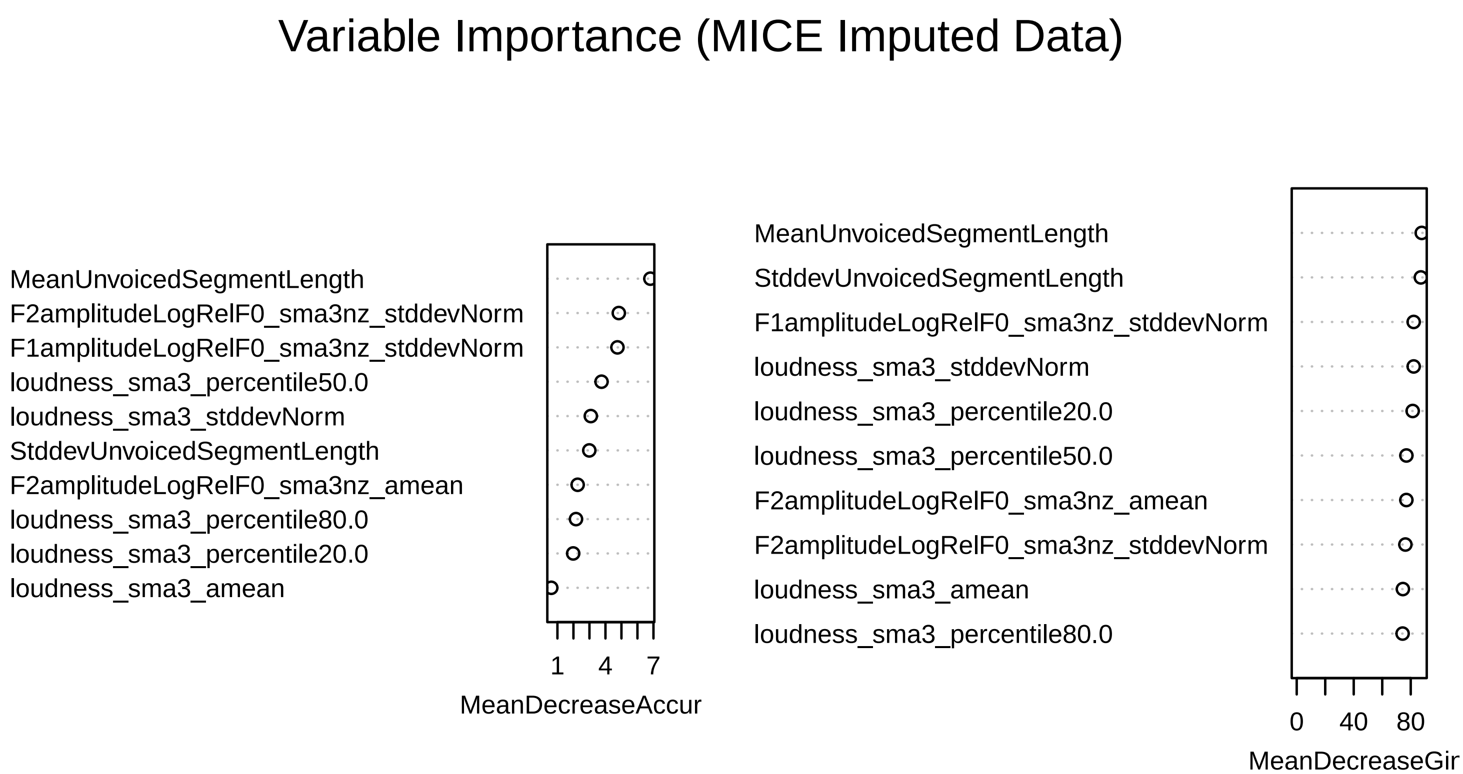
```
Confusion Matrix and Statistics

               Reference
Prediction      Diaper-Change Fussy Hungry Pain Tired
  Diaper-Change            11     8     10   10     7
  Fussy                    17    10     11    8    11
  Hungry                   12    11     10    9    14
  Pain                      6    10     13   19     6
  Tired                     4    11      6    4    12

Overall Statistics

               Accuracy : 0.248
                 95% CI : (0.1957, 0.3063)
    No Information Rate : 0.2
    P-Value [Acc > NIR] : 0.03705

                  Kappa : 0.06

 Mcnemar's Test P-Value : 0.45915

Statistics by Class:

                     Class: Diaper-Change Class: Fussy Class: Hungry
Sensitivity                        0.2200       0.2000        0.2000
Specificity                        0.8250       0.7650        0.7700
Pos Pred Value                     0.2391       0.1754        0.1786
Neg Pred Value                     0.8088       0.7927        0.7938
Prevalence                         0.2000       0.2000        0.2000
Detection Rate                     0.0440       0.0400        0.0400
Detection Prevalence               0.1840       0.2280        0.2240
Balanced Accuracy                  0.5225       0.4825        0.4850
                     Class: Pain Class: Tired
Sensitivity               0.3800       0.2400
Specificity               0.8250       0.8750
Pos Pred Value            0.3519       0.3243
Neg Pred Value            0.8418       0.8216
Prevalence                0.2000       0.2000
```

```
Detection Rate          0.0760      0.0480
Detection Prevalence    0.2160      0.1480
Balanced Accuracy       0.6025      0.5575
```

```r
print(accuracy_imputed)
```

```
Accuracy
   0.248
```

```r
varImpPlot(rf_imputed, main = "Variable Importance (MICE Imputed Data)", cex = 0.7)
```




**XGBoost**

```r
# ensure Reason is a factor
data_imputed$Reason <- as.factor(data_imputed$Reason)

# clean up class levels to be valid R variable names
levels(data_imputed$Reason) <- make.names(levels(data_imputed$Reason))

# train/test split (optional if using cross-validation)
set.seed(605794011)
train_index <- createDataPartition(data_imputed$Reason, p = 0.8, list = FALSE)
train_data <- data_imputed[train_index, ]
test_data <- data_imputed[-train_index, ]

# cross-validation setup
```

```r
ctrl <- trainControl(
  method = "cv",        # 10 fold cross-validaton
  number = 10,
  classProbs = TRUE,    # needed for multiclass AUC etc.
  summaryFunction = multiClassSummary,
  verboseIter = FALSE
)

# train XGBoost model
set.seed(605794011)
invisible(capture.output({
  suppressMessages({
    suppressWarnings({
      xgb_model <- train(
        Reason ~ .,
        data = train_data,
        method = "xgbTree",
        trControl = ctrl,
        tuneLength = 5,       # tries 5 different combinations of params, trains 10 models per set
         ↪  of params, 10 x 5 = 50 models total
        metric = "Accuracy"
      )
    })
  })
}))

# print model summary and best tuning parameters
print(xgb_model)
```

```
eXtreme Gradient Boosting

1000 samples
  10 predictor
   5 classes: 'Diaper.Change', 'Fussy', 'Hungry', 'Pain', 'Tired'

No pre-processing
Resampling: Cross-Validated (10 fold)
Summary of sample sizes: 900, 900, 900, 900, 900, 900, ...
Resampling results across tuning parameters:

  eta  max_depth  colsample_bytree  subsample  nrounds  logLoss   AUC
  0.3  1          0.6               0.500       50      1.622083  0.5531000
  0.3  1          0.6               0.500      100      1.653972  0.5460375
  0.3  1          0.6               0.500      150      1.682211  0.5389875
  0.3  1          0.6               0.500      200      1.712036  0.5370000
  0.3  1          0.6               0.500      250      1.733616  0.5343375
  0.3  1          0.6               0.625       50      1.610880  0.5623375
  0.3  1          0.6               0.625      100      1.641706  0.5511875
  0.3  1          0.6               0.625      150      1.674356  0.5439000
  0.3  1          0.6               0.625      200      1.699994  0.5379500
  0.3  1          0.6               0.625      250      1.722548  0.5365250
  0.3  1          0.6               0.750       50      1.609826  0.5589875
  0.3  1          0.6               0.750      100      1.644689  0.5479625
  0.3  1          0.6               0.750      150      1.674628  0.5410000
```

| | | | | | | |
|---|---|---|---|---|---|---|
| 0.3 | 1 | 0.6 | 0.750 | 200 | 1.707059 | 0.5311125 |
| 0.3 | 1 | 0.6 | 0.750 | 250 | 1.725706 | 0.5300625 |
| 0.3 | 1 | 0.6 | 0.875 | 50 | 1.612310 | 0.5558000 |
| 0.3 | 1 | 0.6 | 0.875 | 100 | 1.646947 | 0.5443875 |
| 0.3 | 1 | 0.6 | 0.875 | 150 | 1.676778 | 0.5359875 |
| 0.3 | 1 | 0.6 | 0.875 | 200 | 1.701503 | 0.5300750 |
| 0.3 | 1 | 0.6 | 0.875 | 250 | 1.727169 | 0.5256750 |
| 0.3 | 1 | 0.6 | 1.000 | 50 | 1.609522 | 0.5518000 |
| 0.3 | 1 | 0.6 | 1.000 | 100 | 1.634070 | 0.5442250 |
| 0.3 | 1 | 0.6 | 1.000 | 150 | 1.656421 | 0.5391750 |
| 0.3 | 1 | 0.6 | 1.000 | 200 | 1.677213 | 0.5340250 |
| 0.3 | 1 | 0.6 | 1.000 | 250 | 1.693684 | 0.5302250 |
| 0.3 | 1 | 0.8 | 0.500 | 50 | 1.623325 | 0.5506375 |
| 0.3 | 1 | 0.8 | 0.500 | 100 | 1.652338 | 0.5476375 |
| 0.3 | 1 | 0.8 | 0.500 | 150 | 1.685991 | 0.5424750 |
| 0.3 | 1 | 0.8 | 0.500 | 200 | 1.714671 | 0.5339875 |
| 0.3 | 1 | 0.8 | 0.500 | 250 | 1.749256 | 0.5252500 |
| 0.3 | 1 | 0.8 | 0.625 | 50 | 1.616717 | 0.5538000 |
| 0.3 | 1 | 0.8 | 0.625 | 100 | 1.647852 | 0.5503875 |
| 0.3 | 1 | 0.8 | 0.625 | 150 | 1.677386 | 0.5422375 |
| 0.3 | 1 | 0.8 | 0.625 | 200 | 1.705661 | 0.5381250 |
| 0.3 | 1 | 0.8 | 0.625 | 250 | 1.732034 | 0.5314875 |
| 0.3 | 1 | 0.8 | 0.750 | 50 | 1.614770 | 0.5543250 |
| 0.3 | 1 | 0.8 | 0.750 | 100 | 1.646151 | 0.5489375 |
| 0.3 | 1 | 0.8 | 0.750 | 150 | 1.678405 | 0.5402250 |
| 0.3 | 1 | 0.8 | 0.750 | 200 | 1.703874 | 0.5342375 |
| 0.3 | 1 | 0.8 | 0.750 | 250 | 1.729168 | 0.5291000 |
| 0.3 | 1 | 0.8 | 0.875 | 50 | 1.614045 | 0.5527625 |
| 0.3 | 1 | 0.8 | 0.875 | 100 | 1.646158 | 0.5443625 |
| 0.3 | 1 | 0.8 | 0.875 | 150 | 1.673664 | 0.5387625 |
| 0.3 | 1 | 0.8 | 0.875 | 200 | 1.699860 | 0.5343625 |
| 0.3 | 1 | 0.8 | 0.875 | 250 | 1.720030 | 0.5328000 |
| 0.3 | 1 | 0.8 | 1.000 | 50 | 1.610616 | 0.5508750 |
| 0.3 | 1 | 0.8 | 1.000 | 100 | 1.633327 | 0.5454375 |
| 0.3 | 1 | 0.8 | 1.000 | 150 | 1.654971 | 0.5398125 |
| 0.3 | 1 | 0.8 | 1.000 | 200 | 1.676281 | 0.5343000 |
| 0.3 | 1 | 0.8 | 1.000 | 250 | 1.694432 | 0.5293250 |
| 0.3 | 2 | 0.6 | 0.500 | 50 | 1.704025 | 0.5313750 |
| 0.3 | 2 | 0.6 | 0.500 | 100 | 1.804554 | 0.5254625 |
| 0.3 | 2 | 0.6 | 0.500 | 150 | 1.894354 | 0.5186875 |
| 0.3 | 2 | 0.6 | 0.500 | 200 | 1.975006 | 0.5105125 |
| 0.3 | 2 | 0.6 | 0.500 | 250 | 2.053404 | 0.5076500 |
| 0.3 | 2 | 0.6 | 0.625 | 50 | 1.697298 | 0.5338750 |
| 0.3 | 2 | 0.6 | 0.625 | 100 | 1.785582 | 0.5315125 |
| 0.3 | 2 | 0.6 | 0.625 | 150 | 1.867173 | 0.5186625 |
| 0.3 | 2 | 0.6 | 0.625 | 200 | 1.954038 | 0.5105000 |
| 0.3 | 2 | 0.6 | 0.625 | 250 | 2.016966 | 0.5113875 |
| 0.3 | 2 | 0.6 | 0.750 | 50 | 1.678522 | 0.5425125 |
| 0.3 | 2 | 0.6 | 0.750 | 100 | 1.782315 | 0.5242375 |
| 0.3 | 2 | 0.6 | 0.750 | 150 | 1.870244 | 0.5184750 |
| 0.3 | 2 | 0.6 | 0.750 | 200 | 1.957353 | 0.5090625 |
| 0.3 | 2 | 0.6 | 0.750 | 250 | 2.031823 | 0.5071750 |
| 0.3 | 2 | 0.6 | 0.875 | 50 | 1.685350 | 0.5354250 |
| 0.3 | 2 | 0.6 | 0.875 | 100 | 1.777469 | 0.5237000 |
| 0.3 | 2 | 0.6 | 0.875 | 150 | 1.851991 | 0.5201625 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 0.3 | 2 | 0.6 | 0.875 | 200 | 1.934409 | 0.5140500 |
| 0.3 | 2 | 0.6 | 0.875 | 250 | 2.006926 | 0.5141250 |
| 0.3 | 2 | 0.6 | 1.000 | 50 | 1.683403 | 0.5242750 |
| 0.3 | 2 | 0.6 | 1.000 | 100 | 1.778992 | 0.5113500 |
| 0.3 | 2 | 0.6 | 1.000 | 150 | 1.856043 | 0.5074875 |
| 0.3 | 2 | 0.6 | 1.000 | 200 | 1.927269 | 0.5054000 |
| 0.3 | 2 | 0.6 | 1.000 | 250 | 2.002188 | 0.5035625 |
| 0.3 | 2 | 0.8 | 0.500 | 50 | 1.697815 | 0.5441125 |
| 0.3 | 2 | 0.8 | 0.500 | 100 | 1.797511 | 0.5314875 |
| 0.3 | 2 | 0.8 | 0.500 | 150 | 1.879019 | 0.5285250 |
| 0.3 | 2 | 0.8 | 0.500 | 200 | 1.946467 | 0.5261625 |
| 0.3 | 2 | 0.8 | 0.500 | 250 | 2.001980 | 0.5264000 |
| 0.3 | 2 | 0.8 | 0.625 | 50 | 1.683613 | 0.5455250 |
| 0.3 | 2 | 0.8 | 0.625 | 100 | 1.790812 | 0.5298000 |
| 0.3 | 2 | 0.8 | 0.625 | 150 | 1.885236 | 0.5205000 |
| 0.3 | 2 | 0.8 | 0.625 | 200 | 1.970900 | 0.5143375 |
| 0.3 | 2 | 0.8 | 0.625 | 250 | 2.035335 | 0.5159250 |
| 0.3 | 2 | 0.8 | 0.750 | 50 | 1.700770 | 0.5265000 |
| 0.3 | 2 | 0.8 | 0.750 | 100 | 1.803632 | 0.5161625 |
| 0.3 | 2 | 0.8 | 0.750 | 150 | 1.898353 | 0.5085750 |
| 0.3 | 2 | 0.8 | 0.750 | 200 | 1.981210 | 0.5048125 |
| 0.3 | 2 | 0.8 | 0.750 | 250 | 2.048161 | 0.5063875 |
| 0.3 | 2 | 0.8 | 0.875 | 50 | 1.693418 | 0.5291500 |
| 0.3 | 2 | 0.8 | 0.875 | 100 | 1.793934 | 0.5173250 |
| 0.3 | 2 | 0.8 | 0.875 | 150 | 1.882952 | 0.5095875 |
| 0.3 | 2 | 0.8 | 0.875 | 200 | 1.961864 | 0.5086125 |
| 0.3 | 2 | 0.8 | 0.875 | 250 | 2.036155 | 0.5064250 |
| 0.3 | 2 | 0.8 | 1.000 | 50 | 1.686902 | 0.5210250 |
| 0.3 | 2 | 0.8 | 1.000 | 100 | 1.791116 | 0.5078875 |
| 0.3 | 2 | 0.8 | 1.000 | 150 | 1.875663 | 0.5056875 |
| 0.3 | 2 | 0.8 | 1.000 | 200 | 1.956712 | 0.5027125 |
| 0.3 | 2 | 0.8 | 1.000 | 250 | 2.034742 | 0.5024375 |
| 0.3 | 3 | 0.6 | 0.500 | 50 | 1.785456 | 0.5325375 |
| 0.3 | 3 | 0.6 | 0.500 | 100 | 1.937698 | 0.5262000 |
| 0.3 | 3 | 0.6 | 0.500 | 150 | 2.076342 | 0.5198875 |
| 0.3 | 3 | 0.6 | 0.500 | 200 | 2.191872 | 0.5184500 |
| 0.3 | 3 | 0.6 | 0.500 | 250 | 2.285524 | 0.5190500 |
| 0.3 | 3 | 0.6 | 0.625 | 50 | 1.766163 | 0.5327750 |
| 0.3 | 3 | 0.6 | 0.625 | 100 | 1.907255 | 0.5275875 |
| 0.3 | 3 | 0.6 | 0.625 | 150 | 2.056634 | 0.5201875 |
| 0.3 | 3 | 0.6 | 0.625 | 200 | 2.188347 | 0.5183625 |
| 0.3 | 3 | 0.6 | 0.625 | 250 | 2.297910 | 0.5166000 |
| 0.3 | 3 | 0.6 | 0.750 | 50 | 1.752932 | 0.5331375 |
| 0.3 | 3 | 0.6 | 0.750 | 100 | 1.905769 | 0.5225250 |
| 0.3 | 3 | 0.6 | 0.750 | 150 | 2.037538 | 0.5202375 |
| 0.3 | 3 | 0.6 | 0.750 | 200 | 2.160441 | 0.5172125 |
| 0.3 | 3 | 0.6 | 0.750 | 250 | 2.263703 | 0.5187250 |
| 0.3 | 3 | 0.6 | 0.875 | 50 | 1.743639 | 0.5310250 |
| 0.3 | 3 | 0.6 | 0.875 | 100 | 1.881258 | 0.5236125 |
| 0.3 | 3 | 0.6 | 0.875 | 150 | 2.015180 | 0.5182875 |
| 0.3 | 3 | 0.6 | 0.875 | 200 | 2.135446 | 0.5133750 |
| 0.3 | 3 | 0.6 | 0.875 | 250 | 2.250090 | 0.5141875 |
| 0.3 | 3 | 0.6 | 1.000 | 50 | 1.756958 | 0.5141625 |
| 0.3 | 3 | 0.6 | 1.000 | 100 | 1.898359 | 0.5073125 |
| 0.3 | 3 | 0.6 | 1.000 | 150 | 2.020832 | 0.5079500 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 0.3 | 3 | 0.6 | 1.000 | 200 | 2.128670 | 0.5130000 |
| 0.3 | 3 | 0.6 | 1.000 | 250 | 2.235146 | 0.5121375 |
| 0.3 | 3 | 0.8 | 0.500 | 50 | 1.804273 | 0.5245375 |
| 0.3 | 3 | 0.8 | 0.500 | 100 | 1.965675 | 0.5199500 |
| 0.3 | 3 | 0.8 | 0.500 | 150 | 2.104190 | 0.5196375 |
| 0.3 | 3 | 0.8 | 0.500 | 200 | 2.236054 | 0.5159125 |
| 0.3 | 3 | 0.8 | 0.500 | 250 | 2.348667 | 0.5157500 |
| 0.3 | 3 | 0.8 | 0.625 | 50 | 1.787780 | 0.5268375 |
| 0.3 | 3 | 0.8 | 0.625 | 100 | 1.965410 | 0.5167375 |
| 0.3 | 3 | 0.8 | 0.625 | 150 | 2.101618 | 0.5142875 |
| 0.3 | 3 | 0.8 | 0.625 | 200 | 2.224935 | 0.5131375 |
| 0.3 | 3 | 0.8 | 0.625 | 250 | 2.339229 | 0.5133000 |
| 0.3 | 3 | 0.8 | 0.750 | 50 | 1.787846 | 0.5220000 |
| 0.3 | 3 | 0.8 | 0.750 | 100 | 1.929335 | 0.5160375 |
| 0.3 | 3 | 0.8 | 0.750 | 150 | 2.070357 | 0.5119125 |
| 0.3 | 3 | 0.8 | 0.750 | 200 | 2.205844 | 0.5091875 |
| 0.3 | 3 | 0.8 | 0.750 | 250 | 2.335594 | 0.5085875 |
| 0.3 | 3 | 0.8 | 0.875 | 50 | 1.763780 | 0.5233000 |
| 0.3 | 3 | 0.8 | 0.875 | 100 | 1.902349 | 0.5219500 |
| 0.3 | 3 | 0.8 | 0.875 | 150 | 2.031215 | 0.5231375 |
| 0.3 | 3 | 0.8 | 0.875 | 200 | 2.155945 | 0.5196625 |
| 0.3 | 3 | 0.8 | 0.875 | 250 | 2.262672 | 0.5210750 |
| 0.3 | 3 | 0.8 | 1.000 | 50 | 1.764181 | 0.5151125 |
| 0.3 | 3 | 0.8 | 1.000 | 100 | 1.914320 | 0.5079625 |
| 0.3 | 3 | 0.8 | 1.000 | 150 | 2.044156 | 0.5090250 |
| 0.3 | 3 | 0.8 | 1.000 | 200 | 2.182249 | 0.5042875 |
| 0.3 | 3 | 0.8 | 1.000 | 250 | 2.294187 | 0.5053875 |
| 0.3 | 4 | 0.6 | 0.500 | 50 | 1.846647 | 0.5417250 |
| 0.3 | 4 | 0.6 | 0.500 | 100 | 2.058554 | 0.5334500 |
| 0.3 | 4 | 0.6 | 0.500 | 150 | 2.225476 | 0.5284375 |
| 0.3 | 4 | 0.6 | 0.500 | 200 | 2.349253 | 0.5287000 |
| 0.3 | 4 | 0.6 | 0.500 | 250 | 2.458246 | 0.5272750 |
| 0.3 | 4 | 0.6 | 0.625 | 50 | 1.872512 | 0.5190125 |
| 0.3 | 4 | 0.6 | 0.625 | 100 | 2.063698 | 0.5179375 |
| 0.3 | 4 | 0.6 | 0.625 | 150 | 2.239773 | 0.5155000 |
| 0.3 | 4 | 0.6 | 0.625 | 200 | 2.391921 | 0.5138500 |
| 0.3 | 4 | 0.6 | 0.625 | 250 | 2.500370 | 0.5159750 |
| 0.3 | 4 | 0.6 | 0.750 | 50 | 1.846563 | 0.5200750 |
| 0.3 | 4 | 0.6 | 0.750 | 100 | 2.064267 | 0.5131000 |
| 0.3 | 4 | 0.6 | 0.750 | 150 | 2.238595 | 0.5126625 |
| 0.3 | 4 | 0.6 | 0.750 | 200 | 2.399115 | 0.5096250 |
| 0.3 | 4 | 0.6 | 0.750 | 250 | 2.519784 | 0.5103875 |
| 0.3 | 4 | 0.6 | 0.875 | 50 | 1.838767 | 0.5173000 |
| 0.3 | 4 | 0.6 | 0.875 | 100 | 2.037352 | 0.5118250 |
| 0.3 | 4 | 0.6 | 0.875 | 150 | 2.205579 | 0.5104125 |
| 0.3 | 4 | 0.6 | 0.875 | 200 | 2.361102 | 0.5090000 |
| 0.3 | 4 | 0.6 | 0.875 | 250 | 2.493581 | 0.5089250 |
| 0.3 | 4 | 0.6 | 1.000 | 50 | 1.801902 | 0.5259375 |
| 0.3 | 4 | 0.6 | 1.000 | 100 | 2.007103 | 0.5122625 |
| 0.3 | 4 | 0.6 | 1.000 | 150 | 2.172361 | 0.5111000 |
| 0.3 | 4 | 0.6 | 1.000 | 200 | 2.317634 | 0.5092625 |
| 0.3 | 4 | 0.6 | 1.000 | 250 | 2.455366 | 0.5063250 |
| 0.3 | 4 | 0.8 | 0.500 | 50 | 1.894025 | 0.5297875 |
| 0.3 | 4 | 0.8 | 0.500 | 100 | 2.136454 | 0.5231750 |
| 0.3 | 4 | 0.8 | 0.500 | 150 | 2.296164 | 0.5221625 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 0.3 | 4 | 0.8 | 0.500 | 200 | 2.413732 | 0.5231500 |
| 0.3 | 4 | 0.8 | 0.500 | 250 | 2.534928 | 0.5230875 |
| 0.3 | 4 | 0.8 | 0.625 | 50 | 1.899705 | 0.5185875 |
| 0.3 | 4 | 0.8 | 0.625 | 100 | 2.112119 | 0.5224875 |
| 0.3 | 4 | 0.8 | 0.625 | 150 | 2.300240 | 0.5182750 |
| 0.3 | 4 | 0.8 | 0.625 | 200 | 2.455384 | 0.5153125 |
| 0.3 | 4 | 0.8 | 0.625 | 250 | 2.574158 | 0.5143500 |
| 0.3 | 4 | 0.8 | 0.750 | 50 | 1.858542 | 0.5245750 |
| 0.3 | 4 | 0.8 | 0.750 | 100 | 2.075272 | 0.5170875 |
| 0.3 | 4 | 0.8 | 0.750 | 150 | 2.252813 | 0.5182375 |
| 0.3 | 4 | 0.8 | 0.750 | 200 | 2.414003 | 0.5149500 |
| 0.3 | 4 | 0.8 | 0.750 | 250 | 2.547417 | 0.5126125 |
| 0.3 | 4 | 0.8 | 0.875 | 50 | 1.861176 | 0.5176625 |
| 0.3 | 4 | 0.8 | 0.875 | 100 | 2.066304 | 0.5148375 |
| 0.3 | 4 | 0.8 | 0.875 | 150 | 2.250467 | 0.5115875 |
| 0.3 | 4 | 0.8 | 0.875 | 200 | 2.408329 | 0.5119250 |
| 0.3 | 4 | 0.8 | 0.875 | 250 | 2.541988 | 0.5102750 |
| 0.3 | 4 | 0.8 | 1.000 | 50 | 1.834338 | 0.5153625 |
| 0.3 | 4 | 0.8 | 1.000 | 100 | 2.030163 | 0.5145500 |
| 0.3 | 4 | 0.8 | 1.000 | 150 | 2.209464 | 0.5121125 |
| 0.3 | 4 | 0.8 | 1.000 | 200 | 2.365060 | 0.5103625 |
| 0.3 | 4 | 0.8 | 1.000 | 250 | 2.493914 | 0.5105500 |
| 0.3 | 5 | 0.6 | 0.500 | 50 | 1.956974 | 0.5228625 |
| 0.3 | 5 | 0.6 | 0.500 | 100 | 2.203522 | 0.5223875 |
| 0.3 | 5 | 0.6 | 0.500 | 150 | 2.380039 | 0.5204375 |
| 0.3 | 5 | 0.6 | 0.500 | 200 | 2.486656 | 0.5232125 |
| 0.3 | 5 | 0.6 | 0.500 | 250 | 2.581081 | 0.5211500 |
| 0.3 | 5 | 0.6 | 0.625 | 50 | 1.948299 | 0.5263500 |
| 0.3 | 5 | 0.6 | 0.625 | 100 | 2.180571 | 0.5237250 |
| 0.3 | 5 | 0.6 | 0.625 | 150 | 2.371336 | 0.5208000 |
| 0.3 | 5 | 0.6 | 0.625 | 200 | 2.491180 | 0.5209500 |
| 0.3 | 5 | 0.6 | 0.625 | 250 | 2.582363 | 0.5207125 |
| 0.3 | 5 | 0.6 | 0.750 | 50 | 1.950875 | 0.5143000 |
| 0.3 | 5 | 0.6 | 0.750 | 100 | 2.213657 | 0.5108750 |
| 0.3 | 5 | 0.6 | 0.750 | 150 | 2.396411 | 0.5128500 |
| 0.3 | 5 | 0.6 | 0.750 | 200 | 2.533701 | 0.5117250 |
| 0.3 | 5 | 0.6 | 0.750 | 250 | 2.631277 | 0.5122625 |
| 0.3 | 5 | 0.6 | 0.875 | 50 | 1.893787 | 0.5228875 |
| 0.3 | 5 | 0.6 | 0.875 | 100 | 2.127066 | 0.5171250 |
| 0.3 | 5 | 0.6 | 0.875 | 150 | 2.320250 | 0.5148500 |
| 0.3 | 5 | 0.6 | 0.875 | 200 | 2.469419 | 0.5142500 |
| 0.3 | 5 | 0.6 | 0.875 | 250 | 2.589145 | 0.5124375 |
| 0.3 | 5 | 0.6 | 1.000 | 50 | 1.870577 | 0.5220250 |
| 0.3 | 5 | 0.6 | 1.000 | 100 | 2.112933 | 0.5091375 |
| 0.3 | 5 | 0.6 | 1.000 | 150 | 2.297277 | 0.5066625 |
| 0.3 | 5 | 0.6 | 1.000 | 200 | 2.436720 | 0.5074875 |
| 0.3 | 5 | 0.6 | 1.000 | 250 | 2.549722 | 0.5079125 |
| 0.3 | 5 | 0.8 | 0.500 | 50 | 1.974677 | 0.5306000 |
| 0.3 | 5 | 0.8 | 0.500 | 100 | 2.223919 | 0.5315250 |
| 0.3 | 5 | 0.8 | 0.500 | 150 | 2.404203 | 0.5277125 |
| 0.3 | 5 | 0.8 | 0.500 | 200 | 2.522440 | 0.5275750 |
| 0.3 | 5 | 0.8 | 0.500 | 250 | 2.612327 | 0.5251250 |
| 0.3 | 5 | 0.8 | 0.625 | 50 | 1.927424 | 0.5422125 |
| 0.3 | 5 | 0.8 | 0.625 | 100 | 2.192999 | 0.5355062 |
| 0.3 | 5 | 0.8 | 0.625 | 150 | 2.370406 | 0.5312750 |

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|---|---|---|---|---|---|---|
| 0.3 | 5 | 0.8 | 0.625 | 200 | 2.500201 | 0.5286375 |
| 0.3 | 5 | 0.8 | 0.625 | 250 | 2.592108 | 0.5264750 |
| 0.3 | 5 | 0.8 | 0.750 | 50 | 1.939876 | 0.5271125 |
| 0.3 | 5 | 0.8 | 0.750 | 100 | 2.206185 | 0.5260625 |
| 0.3 | 5 | 0.8 | 0.750 | 150 | 2.402630 | 0.5216875 |
| 0.3 | 5 | 0.8 | 0.750 | 200 | 2.543338 | 0.5188875 |
| 0.3 | 5 | 0.8 | 0.750 | 250 | 2.639612 | 0.5184500 |
| 0.3 | 5 | 0.8 | 0.875 | 50 | 1.910769 | 0.5244500 |
| 0.3 | 5 | 0.8 | 0.875 | 100 | 2.167223 | 0.5169125 |
| 0.3 | 5 | 0.8 | 0.875 | 150 | 2.374245 | 0.5139500 |
| 0.3 | 5 | 0.8 | 0.875 | 200 | 2.522419 | 0.5133375 |
| 0.3 | 5 | 0.8 | 0.875 | 250 | 2.637521 | 0.5112125 |
| 0.3 | 5 | 0.8 | 1.000 | 50 | 1.888179 | 0.5233750 |
| 0.3 | 5 | 0.8 | 1.000 | 100 | 2.130499 | 0.5148875 |
| 0.3 | 5 | 0.8 | 1.000 | 150 | 2.336260 | 0.5105000 |
| 0.3 | 5 | 0.8 | 1.000 | 200 | 2.481311 | 0.5099625 |
| 0.3 | 5 | 0.8 | 1.000 | 250 | 2.593438 | 0.5104500 |
| 0.4 | 1 | 0.6 | 0.500 | 50 | 1.632317 | 0.5546062 |
| 0.4 | 1 | 0.6 | 0.500 | 100 | 1.682137 | 0.5397250 |
| 0.4 | 1 | 0.6 | 0.500 | 150 | 1.721360 | 0.5330875 |
| 0.4 | 1 | 0.6 | 0.500 | 200 | 1.748899 | 0.5319125 |
| 0.4 | 1 | 0.6 | 0.500 | 250 | 1.783398 | 0.5261875 |
| 0.4 | 1 | 0.6 | 0.625 | 50 | 1.629020 | 0.5525500 |
| 0.4 | 1 | 0.6 | 0.625 | 100 | 1.674983 | 0.5404250 |
| 0.4 | 1 | 0.6 | 0.625 | 150 | 1.712610 | 0.5360500 |
| 0.4 | 1 | 0.6 | 0.625 | 200 | 1.748655 | 0.5276875 |
| 0.4 | 1 | 0.6 | 0.625 | 250 | 1.786947 | 0.5202500 |
| 0.4 | 1 | 0.6 | 0.750 | 50 | 1.629429 | 0.5513875 |
| 0.4 | 1 | 0.6 | 0.750 | 100 | 1.668785 | 0.5405875 |
| 0.4 | 1 | 0.6 | 0.750 | 150 | 1.708984 | 0.5325250 |
| 0.4 | 1 | 0.6 | 0.750 | 200 | 1.745277 | 0.5255000 |
| 0.4 | 1 | 0.6 | 0.750 | 250 | 1.776291 | 0.5212875 |
| 0.4 | 1 | 0.6 | 0.875 | 50 | 1.626931 | 0.5514875 |
| 0.4 | 1 | 0.6 | 0.875 | 100 | 1.666880 | 0.5416125 |
| 0.4 | 1 | 0.6 | 0.875 | 150 | 1.702917 | 0.5346000 |
| 0.4 | 1 | 0.6 | 0.875 | 200 | 1.733429 | 0.5288250 |
| 0.4 | 1 | 0.6 | 0.875 | 250 | 1.765518 | 0.5205500 |
| 0.4 | 1 | 0.6 | 1.000 | 50 | 1.619198 | 0.5508625 |
| 0.4 | 1 | 0.6 | 1.000 | 100 | 1.649340 | 0.5411625 |
| 0.4 | 1 | 0.6 | 1.000 | 150 | 1.676589 | 0.5343250 |
| 0.4 | 1 | 0.6 | 1.000 | 200 | 1.701308 | 0.5290500 |
| 0.4 | 1 | 0.6 | 1.000 | 250 | 1.719932 | 0.5261625 |
| 0.4 | 1 | 0.8 | 0.500 | 50 | 1.633057 | 0.5526000 |
| 0.4 | 1 | 0.8 | 0.500 | 100 | 1.685640 | 0.5395000 |
| 0.4 | 1 | 0.8 | 0.500 | 150 | 1.721810 | 0.5328125 |
| 0.4 | 1 | 0.8 | 0.500 | 200 | 1.760350 | 0.5245250 |
| 0.4 | 1 | 0.8 | 0.500 | 250 | 1.798366 | 0.5194625 |
| 0.4 | 1 | 0.8 | 0.625 | 50 | 1.640257 | 0.5462250 |
| 0.4 | 1 | 0.8 | 0.625 | 100 | 1.677580 | 0.5445250 |
| 0.4 | 1 | 0.8 | 0.625 | 150 | 1.717510 | 0.5343625 |
| 0.4 | 1 | 0.8 | 0.625 | 200 | 1.764565 | 0.5277250 |
| 0.4 | 1 | 0.8 | 0.625 | 250 | 1.789885 | 0.5209875 |
| 0.4 | 1 | 0.8 | 0.750 | 50 | 1.623250 | 0.5575000 |
| 0.4 | 1 | 0.8 | 0.750 | 100 | 1.667837 | 0.5440375 |
| 0.4 | 1 | 0.8 | 0.750 | 150 | 1.703143 | 0.5382500 |

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|---|---|---|---|---|---|---|
| 0.4 | 1 | 0.8 | 0.750 | 200 | 1.740830 | 0.5313125 |
| 0.4 | 1 | 0.8 | 0.750 | 250 | 1.773578 | 0.5252250 |
| 0.4 | 1 | 0.8 | 0.875 | 50 | 1.628184 | 0.5485250 |
| 0.4 | 1 | 0.8 | 0.875 | 100 | 1.666179 | 0.5410125 |
| 0.4 | 1 | 0.8 | 0.875 | 150 | 1.704857 | 0.5333000 |
| 0.4 | 1 | 0.8 | 0.875 | 200 | 1.741617 | 0.5263250 |
| 0.4 | 1 | 0.8 | 0.875 | 250 | 1.771211 | 0.5208125 |
| 0.4 | 1 | 0.8 | 1.000 | 50 | 1.618461 | 0.5506375 |
| 0.4 | 1 | 0.8 | 1.000 | 100 | 1.650245 | 0.5408625 |
| 0.4 | 1 | 0.8 | 1.000 | 150 | 1.677539 | 0.5345500 |
| 0.4 | 1 | 0.8 | 1.000 | 200 | 1.700703 | 0.5289375 |
| 0.4 | 1 | 0.8 | 1.000 | 250 | 1.721144 | 0.5250625 |
| 0.4 | 2 | 0.6 | 0.500 | 50 | 1.765501 | 0.5217000 |
| 0.4 | 2 | 0.6 | 0.500 | 100 | 1.909731 | 0.5069625 |
| 0.4 | 2 | 0.6 | 0.500 | 150 | 2.013817 | 0.5066750 |
| 0.4 | 2 | 0.6 | 0.500 | 200 | 2.102888 | 0.5081375 |
| 0.4 | 2 | 0.6 | 0.500 | 250 | 2.192846 | 0.5098500 |
| 0.4 | 2 | 0.6 | 0.625 | 50 | 1.740726 | 0.5334000 |
| 0.4 | 2 | 0.6 | 0.625 | 100 | 1.871112 | 0.5192000 |
| 0.4 | 2 | 0.6 | 0.625 | 150 | 1.987919 | 0.5166875 |
| 0.4 | 2 | 0.6 | 0.625 | 200 | 2.081047 | 0.5145500 |
| 0.4 | 2 | 0.6 | 0.625 | 250 | 2.162637 | 0.5131875 |
| 0.4 | 2 | 0.6 | 0.750 | 50 | 1.738168 | 0.5249500 |
| 0.4 | 2 | 0.6 | 0.750 | 100 | 1.846239 | 0.5162000 |
| 0.4 | 2 | 0.6 | 0.750 | 150 | 1.950031 | 0.5154125 |
| 0.4 | 2 | 0.6 | 0.750 | 200 | 2.035452 | 0.5152250 |
| 0.4 | 2 | 0.6 | 0.750 | 250 | 2.124255 | 0.5148625 |
| 0.4 | 2 | 0.6 | 0.875 | 50 | 1.729665 | 0.5293125 |
| 0.4 | 2 | 0.6 | 0.875 | 100 | 1.863797 | 0.5133375 |
| 0.4 | 2 | 0.6 | 0.875 | 150 | 1.969232 | 0.5099375 |
| 0.4 | 2 | 0.6 | 0.875 | 200 | 2.078498 | 0.5060750 |
| 0.4 | 2 | 0.6 | 0.875 | 250 | 2.170221 | 0.5061125 |
| 0.4 | 2 | 0.6 | 1.000 | 50 | 1.722131 | 0.5196875 |
| 0.4 | 2 | 0.6 | 1.000 | 100 | 1.832714 | 0.5135500 |
| 0.4 | 2 | 0.6 | 1.000 | 150 | 1.939370 | 0.5083750 |
| 0.4 | 2 | 0.6 | 1.000 | 200 | 2.037825 | 0.5065875 |
| 0.4 | 2 | 0.6 | 1.000 | 250 | 2.134664 | 0.5061750 |
| 0.4 | 2 | 0.8 | 0.500 | 50 | 1.761315 | 0.5349250 |
| 0.4 | 2 | 0.8 | 0.500 | 100 | 1.867661 | 0.5355750 |
| 0.4 | 2 | 0.8 | 0.500 | 150 | 1.988282 | 0.5236375 |
| 0.4 | 2 | 0.8 | 0.500 | 200 | 2.089383 | 0.5209875 |
| 0.4 | 2 | 0.8 | 0.500 | 250 | 2.155299 | 0.5247750 |
| 0.4 | 2 | 0.8 | 0.625 | 50 | 1.750705 | 0.5307250 |
| 0.4 | 2 | 0.8 | 0.625 | 100 | 1.895448 | 0.5173250 |
| 0.4 | 2 | 0.8 | 0.625 | 150 | 2.013512 | 0.5094250 |
| 0.4 | 2 | 0.8 | 0.625 | 200 | 2.107394 | 0.5131750 |
| 0.4 | 2 | 0.8 | 0.625 | 250 | 2.204735 | 0.5094625 |
| 0.4 | 2 | 0.8 | 0.750 | 50 | 1.744933 | 0.5213500 |
| 0.4 | 2 | 0.8 | 0.750 | 100 | 1.876671 | 0.5110875 |
| 0.4 | 2 | 0.8 | 0.750 | 150 | 1.990412 | 0.5071125 |
| 0.4 | 2 | 0.8 | 0.750 | 200 | 2.087944 | 0.5076500 |
| 0.4 | 2 | 0.8 | 0.750 | 250 | 2.196062 | 0.5023875 |
| 0.4 | 2 | 0.8 | 0.875 | 50 | 1.741763 | 0.5211875 |
| 0.4 | 2 | 0.8 | 0.875 | 100 | 1.864845 | 0.5162875 |
| 0.4 | 2 | 0.8 | 0.875 | 150 | 1.970035 | 0.5155000 |

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|---|---|---|---|---|---|---|
| 0.4 | 2 | 0.8 | 0.875 | 200 | 2.076957 | 0.5099375 |
| 0.4 | 2 | 0.8 | 0.875 | 250 | 2.168041 | 0.5096875 |
| 0.4 | 2 | 0.8 | 1.000 | 50 | 1.717290 | 0.5238625 |
| 0.4 | 2 | 0.8 | 1.000 | 100 | 1.837392 | 0.5139875 |
| 0.4 | 2 | 0.8 | 1.000 | 150 | 1.952682 | 0.5091625 |
| 0.4 | 2 | 0.8 | 1.000 | 200 | 2.047707 | 0.5069375 |
| 0.4 | 2 | 0.8 | 1.000 | 250 | 2.147941 | 0.5063250 |
| 0.4 | 3 | 0.6 | 0.500 | 50 | 1.878745 | 0.5308000 |
| 0.4 | 3 | 0.6 | 0.500 | 100 | 2.084280 | 0.5213250 |
| 0.4 | 3 | 0.6 | 0.500 | 150 | 2.261435 | 0.5139250 |
| 0.4 | 3 | 0.6 | 0.500 | 200 | 2.409308 | 0.5149875 |
| 0.4 | 3 | 0.6 | 0.500 | 250 | 2.534038 | 0.5106500 |
| 0.4 | 3 | 0.6 | 0.625 | 50 | 1.852744 | 0.5258750 |
| 0.4 | 3 | 0.6 | 0.625 | 100 | 2.061435 | 0.5172125 |
| 0.4 | 3 | 0.6 | 0.625 | 150 | 2.259549 | 0.5128500 |
| 0.4 | 3 | 0.6 | 0.625 | 200 | 2.413165 | 0.5118625 |
| 0.4 | 3 | 0.6 | 0.625 | 250 | 2.539079 | 0.5109500 |
| 0.4 | 3 | 0.6 | 0.750 | 50 | 1.823096 | 0.5271875 |
| 0.4 | 3 | 0.6 | 0.750 | 100 | 2.020498 | 0.5195500 |
| 0.4 | 3 | 0.6 | 0.750 | 150 | 2.200892 | 0.5166250 |
| 0.4 | 3 | 0.6 | 0.750 | 200 | 2.363433 | 0.5153625 |
| 0.4 | 3 | 0.6 | 0.750 | 250 | 2.493720 | 0.5147625 |
| 0.4 | 3 | 0.6 | 0.875 | 50 | 1.819953 | 0.5251625 |
| 0.4 | 3 | 0.6 | 0.875 | 100 | 2.005132 | 0.5180750 |
| 0.4 | 3 | 0.6 | 0.875 | 150 | 2.152457 | 0.5207375 |
| 0.4 | 3 | 0.6 | 0.875 | 200 | 2.295760 | 0.5214250 |
| 0.4 | 3 | 0.6 | 0.875 | 250 | 2.428434 | 0.5221125 |
| 0.4 | 3 | 0.6 | 1.000 | 50 | 1.811074 | 0.5162000 |
| 0.4 | 3 | 0.6 | 1.000 | 100 | 1.979506 | 0.5134375 |
| 0.4 | 3 | 0.6 | 1.000 | 150 | 2.143206 | 0.5107125 |
| 0.4 | 3 | 0.6 | 1.000 | 200 | 2.275218 | 0.5129500 |
| 0.4 | 3 | 0.6 | 1.000 | 250 | 2.410403 | 0.5110750 |
| 0.4 | 3 | 0.8 | 0.500 | 50 | 1.887573 | 0.5282750 |
| 0.4 | 3 | 0.8 | 0.500 | 100 | 2.100579 | 0.5227250 |
| 0.4 | 3 | 0.8 | 0.500 | 150 | 2.273973 | 0.5227125 |
| 0.4 | 3 | 0.8 | 0.500 | 200 | 2.428786 | 0.5175125 |
| 0.4 | 3 | 0.8 | 0.500 | 250 | 2.563832 | 0.5163875 |
| 0.4 | 3 | 0.8 | 0.625 | 50 | 1.860841 | 0.5292875 |
| 0.4 | 3 | 0.8 | 0.625 | 100 | 2.094780 | 0.5126125 |
| 0.4 | 3 | 0.8 | 0.625 | 150 | 2.268076 | 0.5126750 |
| 0.4 | 3 | 0.8 | 0.625 | 200 | 2.424759 | 0.5109375 |
| 0.4 | 3 | 0.8 | 0.625 | 250 | 2.552819 | 0.5115000 |
| 0.4 | 3 | 0.8 | 0.750 | 50 | 1.836440 | 0.5297875 |
| 0.4 | 3 | 0.8 | 0.750 | 100 | 2.035441 | 0.5221375 |
| 0.4 | 3 | 0.8 | 0.750 | 150 | 2.208698 | 0.5215250 |
| 0.4 | 3 | 0.8 | 0.750 | 200 | 2.364617 | 0.5198875 |
| 0.4 | 3 | 0.8 | 0.750 | 250 | 2.515558 | 0.5165500 |
| 0.4 | 3 | 0.8 | 0.875 | 50 | 1.813931 | 0.5342875 |
| 0.4 | 3 | 0.8 | 0.875 | 100 | 2.025420 | 0.5195000 |
| 0.4 | 3 | 0.8 | 0.875 | 150 | 2.193708 | 0.5193250 |
| 0.4 | 3 | 0.8 | 0.875 | 200 | 2.352313 | 0.5181625 |
| 0.4 | 3 | 0.8 | 0.875 | 250 | 2.491643 | 0.5177250 |
| 0.4 | 3 | 0.8 | 1.000 | 50 | 1.827960 | 0.5131000 |
| 0.4 | 3 | 0.8 | 1.000 | 100 | 2.022742 | 0.5077250 |
| 0.4 | 3 | 0.8 | 1.000 | 150 | 2.180338 | 0.5076125 |

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| 0.4 | 3 | 0.8 | 1.000 | 200 | 2.333556 | 0.5062500 |
| 0.4 | 3 | 0.8 | 1.000 | 250 | 2.489699 | 0.5051375 |
| 0.4 | 4 | 0.6 | 0.500 | 50 | 2.004810 | 0.5196875 |
| 0.4 | 4 | 0.6 | 0.500 | 100 | 2.276647 | 0.5114375 |
| 0.4 | 4 | 0.6 | 0.500 | 150 | 2.483665 | 0.5093875 |
| 0.4 | 4 | 0.6 | 0.500 | 200 | 2.635350 | 0.5090250 |
| 0.4 | 4 | 0.6 | 0.500 | 250 | 2.749064 | 0.5054250 |
| 0.4 | 4 | 0.6 | 0.625 | 50 | 1.975794 | 0.5216500 |
| 0.4 | 4 | 0.6 | 0.625 | 100 | 2.227814 | 0.5235625 |
| 0.4 | 4 | 0.6 | 0.625 | 150 | 2.429752 | 0.5240750 |
| 0.4 | 4 | 0.6 | 0.625 | 200 | 2.562406 | 0.5223625 |
| 0.4 | 4 | 0.6 | 0.625 | 250 | 2.681322 | 0.5213000 |
| 0.4 | 4 | 0.6 | 0.750 | 50 | 1.996209 | 0.5090750 |
| 0.4 | 4 | 0.6 | 0.750 | 100 | 2.238932 | 0.5149250 |
| 0.4 | 4 | 0.6 | 0.750 | 150 | 2.417397 | 0.5177625 |
| 0.4 | 4 | 0.6 | 0.750 | 200 | 2.560308 | 0.5192625 |
| 0.4 | 4 | 0.6 | 0.750 | 250 | 2.682177 | 0.5187625 |
| 0.4 | 4 | 0.6 | 0.875 | 50 | 1.919118 | 0.5225500 |
| 0.4 | 4 | 0.6 | 0.875 | 100 | 2.156219 | 0.5216500 |
| 0.4 | 4 | 0.6 | 0.875 | 150 | 2.359137 | 0.5210000 |
| 0.4 | 4 | 0.6 | 0.875 | 200 | 2.533044 | 0.5192250 |
| 0.4 | 4 | 0.6 | 0.875 | 250 | 2.655566 | 0.5190000 |
| 0.4 | 4 | 0.6 | 1.000 | 50 | 1.889881 | 0.5210375 |
| 0.4 | 4 | 0.6 | 1.000 | 100 | 2.126331 | 0.5134375 |
| 0.4 | 4 | 0.6 | 1.000 | 150 | 2.333438 | 0.5095125 |
| 0.4 | 4 | 0.6 | 1.000 | 200 | 2.495440 | 0.5077250 |
| 0.4 | 4 | 0.6 | 1.000 | 250 | 2.625655 | 0.5059875 |
| 0.4 | 4 | 0.8 | 0.500 | 50 | 2.007596 | 0.5248625 |
| 0.4 | 4 | 0.8 | 0.500 | 100 | 2.278026 | 0.5195000 |
| 0.4 | 4 | 0.8 | 0.500 | 150 | 2.458493 | 0.5201500 |
| 0.4 | 4 | 0.8 | 0.500 | 200 | 2.600591 | 0.5185375 |
| 0.4 | 4 | 0.8 | 0.500 | 250 | 2.708361 | 0.5160500 |
| 0.4 | 4 | 0.8 | 0.625 | 50 | 2.035149 | 0.5069500 |
| 0.4 | 4 | 0.8 | 0.625 | 100 | 2.305754 | 0.5055375 |
| 0.4 | 4 | 0.8 | 0.625 | 150 | 2.502881 | 0.5081000 |
| 0.4 | 4 | 0.8 | 0.625 | 200 | 2.671480 | 0.5041500 |
| 0.4 | 4 | 0.8 | 0.625 | 250 | 2.779576 | 0.5049750 |
| 0.4 | 4 | 0.8 | 0.750 | 50 | 1.954644 | 0.5236625 |
| 0.4 | 4 | 0.8 | 0.750 | 100 | 2.240623 | 0.5171125 |
| 0.4 | 4 | 0.8 | 0.750 | 150 | 2.453239 | 0.5159750 |
| 0.4 | 4 | 0.8 | 0.750 | 200 | 2.603189 | 0.5160250 |
| 0.4 | 4 | 0.8 | 0.750 | 250 | 2.712333 | 0.5163500 |
| 0.4 | 4 | 0.8 | 0.875 | 50 | 1.932006 | 0.5265625 |
| 0.4 | 4 | 0.8 | 0.875 | 100 | 2.194969 | 0.5206000 |
| 0.4 | 4 | 0.8 | 0.875 | 150 | 2.404689 | 0.5185000 |
| 0.4 | 4 | 0.8 | 0.875 | 200 | 2.563578 | 0.5184750 |
| 0.4 | 4 | 0.8 | 0.875 | 250 | 2.688240 | 0.5165625 |
| 0.4 | 4 | 0.8 | 1.000 | 50 | 1.911366 | 0.5161125 |
| 0.4 | 4 | 0.8 | 1.000 | 100 | 2.158304 | 0.5126625 |
| 0.4 | 4 | 0.8 | 1.000 | 150 | 2.370105 | 0.5124875 |
| 0.4 | 4 | 0.8 | 1.000 | 200 | 2.532255 | 0.5125000 |
| 0.4 | 4 | 0.8 | 1.000 | 250 | 2.656985 | 0.5135500 |
| 0.4 | 5 | 0.6 | 0.500 | 50 | 2.119384 | 0.5226750 |
| 0.4 | 5 | 0.6 | 0.500 | 100 | 2.417031 | 0.5163000 |
| 0.4 | 5 | 0.6 | 0.500 | 150 | 2.581004 | 0.5145875 |

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|---|---|---|---|---|---|---|
| 0.4 | 5 | 0.6 | 0.500 | 200 | 2.687803 | 0.5130000 |
| 0.4 | 5 | 0.6 | 0.500 | 250 | 2.766937 | 0.5126125 |
| 0.4 | 5 | 0.6 | 0.625 | 50 | 2.053051 | 0.5301875 |
| 0.4 | 5 | 0.6 | 0.625 | 100 | 2.348487 | 0.5236125 |
| 0.4 | 5 | 0.6 | 0.625 | 150 | 2.539558 | 0.5229875 |
| 0.4 | 5 | 0.6 | 0.625 | 200 | 2.640786 | 0.5235250 |
| 0.4 | 5 | 0.6 | 0.625 | 250 | 2.719239 | 0.5227750 |
| 0.4 | 5 | 0.6 | 0.750 | 50 | 2.041403 | 0.5297375 |
| 0.4 | 5 | 0.6 | 0.750 | 100 | 2.336032 | 0.5279250 |
| 0.4 | 5 | 0.6 | 0.750 | 150 | 2.527214 | 0.5234750 |
| 0.4 | 5 | 0.6 | 0.750 | 200 | 2.647308 | 0.5234750 |
| 0.4 | 5 | 0.6 | 0.750 | 250 | 2.731680 | 0.5224750 |
| 0.4 | 5 | 0.6 | 0.875 | 50 | 1.996648 | 0.5267125 |
| 0.4 | 5 | 0.6 | 0.875 | 100 | 2.276300 | 0.5274000 |
| 0.4 | 5 | 0.6 | 0.875 | 150 | 2.500888 | 0.5196000 |
| 0.4 | 5 | 0.6 | 0.875 | 200 | 2.643933 | 0.5163125 |
| 0.4 | 5 | 0.6 | 0.875 | 250 | 2.737430 | 0.5160500 |
| 0.4 | 5 | 0.6 | 1.000 | 50 | 1.984762 | 0.5155875 |
| 0.4 | 5 | 0.6 | 1.000 | 100 | 2.252942 | 0.5113250 |
| 0.4 | 5 | 0.6 | 1.000 | 150 | 2.442682 | 0.5109000 |
| 0.4 | 5 | 0.6 | 1.000 | 200 | 2.591718 | 0.5108125 |
| 0.4 | 5 | 0.6 | 1.000 | 250 | 2.693523 | 0.5112375 |
| 0.4 | 5 | 0.8 | 0.500 | 50 | 2.138886 | 0.5192250 |
| 0.4 | 5 | 0.8 | 0.500 | 100 | 2.440891 | 0.5140125 |
| 0.4 | 5 | 0.8 | 0.500 | 150 | 2.626910 | 0.5113625 |
| 0.4 | 5 | 0.8 | 0.500 | 200 | 2.754321 | 0.5088375 |
| 0.4 | 5 | 0.8 | 0.500 | 250 | 2.812949 | 0.5095250 |
| 0.4 | 5 | 0.8 | 0.625 | 50 | 2.109922 | 0.5263375 |
| 0.4 | 5 | 0.8 | 0.625 | 100 | 2.423349 | 0.5220375 |
| 0.4 | 5 | 0.8 | 0.625 | 150 | 2.597857 | 0.5185625 |
| 0.4 | 5 | 0.8 | 0.625 | 200 | 2.712671 | 0.5162000 |
| 0.4 | 5 | 0.8 | 0.625 | 250 | 2.794734 | 0.5146625 |
| 0.4 | 5 | 0.8 | 0.750 | 50 | 2.086250 | 0.5218375 |
| 0.4 | 5 | 0.8 | 0.750 | 100 | 2.402814 | 0.5174750 |
| 0.4 | 5 | 0.8 | 0.750 | 150 | 2.574556 | 0.5188875 |
| 0.4 | 5 | 0.8 | 0.750 | 200 | 2.692567 | 0.5165875 |
| 0.4 | 5 | 0.8 | 0.750 | 250 | 2.774315 | 0.5154000 |
| 0.4 | 5 | 0.8 | 0.875 | 50 | 2.052983 | 0.5158125 |
| 0.4 | 5 | 0.8 | 0.875 | 100 | 2.355130 | 0.5118875 |
| 0.4 | 5 | 0.8 | 0.875 | 150 | 2.560160 | 0.5124875 |
| 0.4 | 5 | 0.8 | 0.875 | 200 | 2.690163 | 0.5126875 |
| 0.4 | 5 | 0.8 | 0.875 | 250 | 2.774833 | 0.5128750 |
| 0.4 | 5 | 0.8 | 1.000 | 50 | 2.017544 | 0.5135875 |
| 0.4 | 5 | 0.8 | 1.000 | 100 | 2.313075 | 0.5094625 |
| 0.4 | 5 | 0.8 | 1.000 | 150 | 2.522506 | 0.5092125 |
| 0.4 | 5 | 0.8 | 1.000 | 200 | 2.673726 | 0.5094750 |
| 0.4 | 5 | 0.8 | 1.000 | 250 | 2.782299 | 0.5089000 |

| prAUC | Accuracy | Kappa | Mean_F1 | Mean_Sensitivity |
|---|---|---|---|---|
| 0.2409999 | 0.247 | 5.875000e-02 | 0.2345539 | 0.247 |
| 0.2347799 | 0.233 | 4.125000e-02 | 0.2322273 | 0.233 |
| 0.2317203 | 0.228 | 3.500000e-02 | 0.2233178 | 0.228 |
| 0.2316555 | 0.225 | 3.125000e-02 | 0.2235788 | 0.225 |
| 0.2314141 | 0.231 | 3.875000e-02 | 0.2301568 | 0.231 |
| 0.2448351 | 0.255 | 6.875000e-02 | 0.2502481 | 0.255 |
| 0.2419446 | 0.246 | 5.750000e-02 | 0.2467271 | 0.246 |

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|---|---|---|---|---|
| 0.2360568 | 0.227 | 3.375000e-02 | 0.2297852 | 0.227 |
| 0.2331528 | 0.210 | 1.250000e-02 | 0.2238900 | 0.210 |
| 0.2310396 | 0.203 | 3.750000e-03 | 0.2156322 | 0.203 |
| 0.2479057 | 0.272 | 9.000000e-02 | 0.2623901 | 0.272 |
| 0.2350077 | 0.242 | 5.250000e-02 | 0.2451579 | 0.242 |
| 0.2320909 | 0.222 | 2.750000e-02 | 0.2191149 | 0.222 |
| 0.2263472 | 0.212 | 1.500000e-02 | 0.2173695 | 0.212 |
| 0.2271454 | 0.204 | 5.000000e-03 | 0.2140044 | 0.204 |
| 0.2408065 | 0.257 | 7.125000e-02 | 0.2434317 | 0.257 |
| 0.2331056 | 0.240 | 5.000000e-02 | 0.2416736 | 0.240 |
| 0.2300423 | 0.230 | 3.750000e-02 | 0.2345899 | 0.230 |
| 0.2268929 | 0.212 | 1.500000e-02 | 0.2245720 | 0.212 |
| 0.2248866 | 0.204 | 5.000000e-03 | 0.1987182 | 0.204 |
| 0.2390402 | 0.272 | 9.000000e-02 | 0.2668467 | 0.272 |
| 0.2340166 | 0.247 | 5.875000e-02 | 0.2368959 | 0.247 |
| 0.2318819 | 0.241 | 5.125000e-02 | 0.2358329 | 0.241 |
| 0.2290295 | 0.226 | 3.250000e-02 | 0.2252870 | 0.226 |
| 0.2258954 | 0.227 | 3.375000e-02 | 0.2265921 | 0.227 |
| 0.2430118 | 0.248 | 6.000000e-02 | 0.2423893 | 0.248 |
| 0.2382267 | 0.232 | 4.000000e-02 | 0.2299045 | 0.232 |
| 0.2332135 | 0.223 | 2.875000e-02 | 0.2242644 | 0.223 |
| 0.2284968 | 0.211 | 1.375000e-02 | 0.2112733 | 0.211 |
| 0.2273446 | 0.225 | 3.125000e-02 | 0.2263265 | 0.225 |
| 0.2411929 | 0.254 | 6.750000e-02 | 0.2542639 | 0.254 |
| 0.2397291 | 0.244 | 5.500000e-02 | 0.2558097 | 0.244 |
| 0.2323955 | 0.223 | 2.875000e-02 | 0.2343192 | 0.223 |
| 0.2311884 | 0.218 | 2.250000e-02 | 0.2277165 | 0.218 |
| 0.2271412 | 0.219 | 2.375000e-02 | 0.2269628 | 0.219 |
| 0.2428945 | 0.263 | 7.875000e-02 | 0.2522821 | 0.263 |
| 0.2321509 | 0.234 | 4.250000e-02 | 0.2323638 | 0.234 |
| 0.2294227 | 0.226 | 3.250000e-02 | 0.2319939 | 0.226 |
| 0.2281486 | 0.223 | 2.875000e-02 | 0.2238630 | 0.223 |
| 0.2273702 | 0.217 | 2.125000e-02 | 0.2199336 | 0.217 |
| 0.2395192 | 0.261 | 7.625000e-02 | 0.2538851 | 0.261 |
| 0.2363835 | 0.237 | 4.625000e-02 | 0.2309410 | 0.237 |
| 0.2300172 | 0.228 | 3.500000e-02 | 0.2267693 | 0.228 |
| 0.2289620 | 0.205 | 6.250000e-03 | 0.2078806 | 0.205 |
| 0.2280531 | 0.211 | 1.375000e-02 | 0.2148572 | 0.211 |
| 0.2370578 | 0.270 | 8.750000e-02 | 0.2597719 | 0.270 |
| 0.2338413 | 0.247 | 5.875000e-02 | 0.2368319 | 0.247 |
| 0.2320999 | 0.236 | 4.500000e-02 | 0.2325500 | 0.236 |
| 0.2290467 | 0.228 | 3.500000e-02 | 0.2268140 | 0.228 |
| 0.2257330 | 0.218 | 2.250000e-02 | 0.2185306 | 0.218 |
| 0.2264010 | 0.211 | 1.375000e-02 | 0.2132341 | 0.211 |
| 0.2233933 | 0.210 | 1.250000e-02 | 0.2123071 | 0.210 |
| 0.2230237 | 0.212 | 1.500000e-02 | 0.2158151 | 0.212 |
| 0.2192765 | 0.205 | 6.250000e-03 | 0.2092237 | 0.205 |
| 0.2160506 | 0.209 | 1.125000e-02 | 0.2117212 | 0.209 |
| 0.2309321 | 0.234 | 4.250000e-02 | 0.2287816 | 0.234 |
| 0.2281354 | 0.225 | 3.125000e-02 | 0.2290207 | 0.225 |
| 0.2231926 | 0.225 | 3.125000e-02 | 0.2215484 | 0.225 |
| 0.2172180 | 0.214 | 1.750000e-02 | 0.2117696 | 0.214 |
| 0.2171076 | 0.210 | 1.250000e-02 | 0.2078450 | 0.210 |
| 0.2322075 | 0.227 | 3.375000e-02 | 0.2278490 | 0.227 |
| 0.2242312 | 0.196 | -5.000000e-03 | 0.1986030 | 0.196 |

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|---|---|---|---|---|
| 0.2152748 | 0.191 | -1.125000e-02 | 0.1887355 | 0.191 |
| 0.2134469 | 0.188 | -1.500000e-02 | 0.1854663 | 0.188 |
| 0.2118808 | 0.189 | -1.375000e-02 | 0.1874732 | 0.189 |
| 0.2277894 | 0.217 | 2.125000e-02 | 0.2112236 | 0.217 |
| 0.2229202 | 0.205 | 6.250000e-03 | 0.2063301 | 0.205 |
| 0.2202569 | 0.210 | 1.250000e-02 | 0.2078773 | 0.210 |
| 0.2185088 | 0.195 | -6.250000e-03 | 0.1942899 | 0.195 |
| 0.2177217 | 0.204 | 5.000000e-03 | 0.2068482 | 0.204 |
| 0.2264963 | 0.229 | 3.625000e-02 | 0.2279212 | 0.229 |
| 0.2155296 | 0.201 | 1.250000e-03 | 0.2048074 | 0.201 |
| 0.2146717 | 0.194 | -7.500000e-03 | 0.1922373 | 0.194 |
| 0.2112501 | 0.208 | 1.000000e-02 | 0.2101337 | 0.208 |
| 0.2102697 | 0.203 | 3.750000e-03 | 0.1990501 | 0.203 |
| 0.2353534 | 0.238 | 4.750000e-02 | 0.2432074 | 0.238 |
| 0.2281197 | 0.242 | 5.250000e-02 | 0.2394429 | 0.242 |
| 0.2238184 | 0.221 | 2.625000e-02 | 0.2197166 | 0.221 |
| 0.2237588 | 0.210 | 1.250000e-02 | 0.2070927 | 0.210 |
| 0.2219595 | 0.211 | 1.375000e-02 | 0.2104611 | 0.211 |
| 0.2284403 | 0.216 | 2.000000e-02 | 0.2104717 | 0.216 |
| 0.2256250 | 0.204 | 5.000000e-03 | 0.2000876 | 0.204 |
| 0.2198980 | 0.209 | 1.125000e-02 | 0.2067102 | 0.209 |
| 0.2182240 | 0.209 | 1.125000e-02 | 0.2081292 | 0.209 |
| 0.2182189 | 0.209 | 1.125000e-02 | 0.2111807 | 0.209 |
| 0.2239029 | 0.202 | 2.500000e-03 | 0.2094683 | 0.202 |
| 0.2176049 | 0.203 | 3.750000e-03 | 0.2013041 | 0.203 |
| 0.2134180 | 0.193 | -8.750000e-03 | 0.1901633 | 0.193 |
| 0.2129760 | 0.204 | 5.000000e-03 | 0.2009315 | 0.204 |
| 0.2098715 | 0.189 | -1.375000e-02 | 0.1865899 | 0.189 |
| 0.2292437 | 0.227 | 3.375000e-02 | 0.2350691 | 0.227 |
| 0.2199296 | 0.201 | 1.250000e-03 | 0.2124127 | 0.201 |
| 0.2168152 | 0.195 | -6.250000e-03 | 0.2135832 | 0.195 |
| 0.2152661 | 0.196 | -5.000000e-03 | 0.2026198 | 0.196 |
| 0.2155137 | 0.191 | -1.125000e-02 | 0.1913954 | 0.191 |
| 0.2233461 | 0.218 | 2.250000e-02 | 0.2225963 | 0.218 |
| 0.2130304 | 0.202 | 2.500000e-03 | 0.1995190 | 0.202 |
| 0.2120732 | 0.196 | -5.000000e-03 | 0.1956527 | 0.196 |
| 0.2122928 | 0.195 | -6.250000e-03 | 0.1941984 | 0.195 |
| 0.2102378 | 0.191 | -1.125000e-02 | 0.1925338 | 0.191 |
| 0.2243871 | 0.218 | 2.250000e-02 | 0.2187763 | 0.218 |
| 0.2243036 | 0.223 | 2.875000e-02 | 0.2184594 | 0.223 |
| 0.2198020 | 0.222 | 2.750000e-02 | 0.2188925 | 0.222 |
| 0.2203050 | 0.211 | 1.375000e-02 | 0.2071638 | 0.211 |
| 0.2167840 | 0.219 | 2.375000e-02 | 0.2147121 | 0.219 |
| 0.2250515 | 0.227 | 3.375000e-02 | 0.2310645 | 0.227 |
| 0.2285194 | 0.217 | 2.125000e-02 | 0.2235287 | 0.217 |
| 0.2234450 | 0.224 | 3.000000e-02 | 0.2308258 | 0.224 |
| 0.2227441 | 0.225 | 3.125000e-02 | 0.2242466 | 0.225 |
| 0.2193273 | 0.213 | 1.625000e-02 | 0.2103140 | 0.213 |
| 0.2283092 | 0.218 | 2.250000e-02 | 0.2246244 | 0.218 |
| 0.2245363 | 0.222 | 2.750000e-02 | 0.2170807 | 0.222 |
| 0.2220229 | 0.210 | 1.250000e-02 | 0.2045292 | 0.210 |
| 0.2193838 | 0.213 | 1.625000e-02 | 0.2100425 | 0.213 |
| 0.2185168 | 0.211 | 1.375000e-02 | 0.2121598 | 0.211 |
| 0.2254597 | 0.209 | 1.125000e-02 | 0.2072258 | 0.209 |
| 0.2206421 | 0.220 | 2.500000e-02 | 0.2169906 | 0.220 |

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|---|---|---|---|---|
| 0.2165215 | 0.216 | 2.000000e-02 | 0.2209890 | 0.216 |
| 0.2147679 | 0.203 | 3.750000e-03 | 0.1994127 | 0.203 |
| 0.2156936 | 0.200 | -6.938894e-18 | 0.1965944 | 0.200 |
| 0.2200766 | 0.216 | 2.000000e-02 | 0.2212949 | 0.216 |
| 0.2137747 | 0.212 | 1.500000e-02 | 0.2146908 | 0.212 |
| 0.2111204 | 0.205 | 6.250000e-03 | 0.2005575 | 0.205 |
| 0.2135535 | 0.201 | 1.250000e-03 | 0.1990031 | 0.201 |
| 0.2151709 | 0.204 | 5.000000e-03 | 0.2012590 | 0.204 |
| 0.2186153 | 0.232 | 4.000000e-02 | 0.2287386 | 0.232 |
| 0.2238087 | 0.209 | 1.125000e-02 | 0.2104064 | 0.209 |
| 0.2234543 | 0.230 | 3.750000e-02 | 0.2258133 | 0.230 |
| 0.2214059 | 0.210 | 1.250000e-02 | 0.2084192 | 0.210 |
| 0.2235399 | 0.201 | 1.250000e-03 | 0.1990640 | 0.201 |
| 0.2253018 | 0.208 | 1.000000e-02 | 0.2103702 | 0.208 |
| 0.2190482 | 0.211 | 1.375000e-02 | 0.2093877 | 0.211 |
| 0.2172883 | 0.211 | 1.375000e-02 | 0.2075475 | 0.211 |
| 0.2154009 | 0.203 | 3.750000e-03 | 0.2016788 | 0.203 |
| 0.2138527 | 0.194 | -7.500000e-03 | 0.1898500 | 0.194 |
| 0.2187046 | 0.204 | 5.000000e-03 | 0.2083207 | 0.204 |
| 0.2178481 | 0.211 | 1.375000e-02 | 0.2062808 | 0.211 |
| 0.2160489 | 0.192 | -1.000000e-02 | 0.1879366 | 0.192 |
| 0.2141158 | 0.201 | 1.250000e-03 | 0.1975849 | 0.201 |
| 0.2135488 | 0.201 | 1.250000e-03 | 0.1991497 | 0.201 |
| 0.2210938 | 0.226 | 3.250000e-02 | 0.2283350 | 0.226 |
| 0.2222101 | 0.214 | 1.750000e-02 | 0.2116639 | 0.214 |
| 0.2231894 | 0.212 | 1.500000e-02 | 0.2077410 | 0.212 |
| 0.2201541 | 0.212 | 1.500000e-02 | 0.2074974 | 0.212 |
| 0.2216445 | 0.213 | 1.625000e-02 | 0.2091134 | 0.213 |
| 0.2161614 | 0.217 | 2.125000e-02 | 0.2134198 | 0.217 |
| 0.2128443 | 0.197 | -3.750000e-03 | 0.1940553 | 0.197 |
| 0.2121343 | 0.206 | 7.500000e-03 | 0.2016762 | 0.206 |
| 0.2101652 | 0.198 | -2.500000e-03 | 0.1938532 | 0.198 |
| 0.2117544 | 0.196 | -5.000000e-03 | 0.1916503 | 0.196 |
| 0.2283416 | 0.225 | 3.125000e-02 | 0.2275391 | 0.225 |
| 0.2268189 | 0.215 | 1.875000e-02 | 0.2126025 | 0.215 |
| 0.2230606 | 0.205 | 6.250000e-03 | 0.2034793 | 0.205 |
| 0.2220488 | 0.215 | 1.875000e-02 | 0.2133003 | 0.215 |
| 0.2218928 | 0.210 | 1.250000e-02 | 0.2064827 | 0.210 |
| 0.2195069 | 0.205 | 6.250000e-03 | 0.2029074 | 0.205 |
| 0.2191273 | 0.211 | 1.375000e-02 | 0.2091661 | 0.211 |
| 0.2200214 | 0.212 | 1.500000e-02 | 0.2104695 | 0.212 |
| 0.2189714 | 0.206 | 7.500000e-03 | 0.2058200 | 0.206 |
| 0.2194734 | 0.205 | 6.250000e-03 | 0.2009062 | 0.205 |
| 0.2180124 | 0.209 | 1.125000e-02 | 0.2051706 | 0.209 |
| 0.2160251 | 0.207 | 8.750000e-03 | 0.2004331 | 0.207 |
| 0.2169255 | 0.200 | -1.387779e-17 | 0.1981978 | 0.200 |
| 0.2146731 | 0.206 | 7.500000e-03 | 0.2038978 | 0.206 |
| 0.2141647 | 0.206 | 7.500000e-03 | 0.2022514 | 0.206 |
| 0.2158417 | 0.210 | 1.250000e-02 | 0.2103950 | 0.210 |
| 0.2138753 | 0.188 | -1.500000e-02 | 0.1865900 | 0.188 |
| 0.2131287 | 0.190 | -1.250000e-02 | 0.1910533 | 0.190 |
| 0.2128228 | 0.189 | -1.375000e-02 | 0.1868380 | 0.189 |
| 0.2129802 | 0.193 | -8.750000e-03 | 0.1886261 | 0.193 |
| 0.2262997 | 0.226 | 3.250000e-02 | 0.2255397 | 0.226 |
| 0.2190181 | 0.188 | -1.500000e-02 | 0.1832013 | 0.188 |

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|---|---|---|---|---|
| 0.2174408 | 0.193 | -8.750000e-03 | 0.1869588 | 0.193 |
| 0.2181677 | 0.190 | -1.250000e-02 | 0.1836790 | 0.190 |
| 0.2156553 | 0.192 | -1.000000e-02 | 0.1864809 | 0.192 |
| 0.2255228 | 0.215 | 1.875000e-02 | 0.2112336 | 0.215 |
| 0.2201006 | 0.214 | 1.750000e-02 | 0.2113237 | 0.214 |
| 0.2210079 | 0.213 | 1.625000e-02 | 0.2079000 | 0.213 |
| 0.2198716 | 0.217 | 2.125000e-02 | 0.2113761 | 0.217 |
| 0.2210269 | 0.209 | 1.125000e-02 | 0.2054713 | 0.209 |
| 0.2217720 | 0.202 | 2.500000e-03 | 0.2003184 | 0.202 |
| 0.2225565 | 0.202 | 2.500000e-03 | 0.2003637 | 0.202 |
| 0.2214077 | 0.197 | -3.750000e-03 | 0.1931507 | 0.197 |
| 0.2189570 | 0.199 | -1.250000e-03 | 0.1954007 | 0.199 |
| 0.2173664 | 0.196 | -5.000000e-03 | 0.1920709 | 0.196 |
| 0.2248324 | 0.214 | 1.750000e-02 | 0.2124932 | 0.214 |
| 0.2201629 | 0.215 | 1.875000e-02 | 0.2118150 | 0.215 |
| 0.2172056 | 0.207 | 8.750000e-03 | 0.2044335 | 0.207 |
| 0.2165323 | 0.206 | 7.500000e-03 | 0.2035580 | 0.206 |
| 0.2147429 | 0.193 | -8.750000e-03 | 0.1900371 | 0.193 |
| 0.2150034 | 0.207 | 8.750000e-03 | 0.2074214 | 0.207 |
| 0.2175540 | 0.202 | 2.500000e-03 | 0.1993145 | 0.202 |
| 0.2152609 | 0.202 | 2.500000e-03 | 0.1985456 | 0.202 |
| 0.2155368 | 0.203 | 3.750000e-03 | 0.1990381 | 0.203 |
| 0.2148830 | 0.203 | 3.750000e-03 | 0.1999330 | 0.203 |
| 0.2182655 | 0.213 | 1.625000e-02 | 0.2161286 | 0.213 |
| 0.2169196 | 0.198 | -2.500000e-03 | 0.1931317 | 0.198 |
| 0.2153041 | 0.195 | -6.250000e-03 | 0.1871579 | 0.195 |
| 0.2145709 | 0.184 | -2.000000e-02 | 0.1843865 | 0.184 |
| 0.2155953 | 0.182 | -2.250000e-02 | 0.1765333 | 0.182 |
| 0.2192705 | 0.194 | -7.500000e-03 | 0.1907551 | 0.194 |
| 0.2206791 | 0.202 | 2.500000e-03 | 0.2001344 | 0.202 |
| 0.2210108 | 0.212 | 1.500000e-02 | 0.2091837 | 0.212 |
| 0.2226803 | 0.212 | 1.500000e-02 | 0.2102390 | 0.212 |
| 0.2229813 | 0.213 | 1.625000e-02 | 0.2109878 | 0.213 |
| 0.2199584 | 0.210 | 1.250000e-02 | 0.2060965 | 0.210 |
| 0.2186813 | 0.209 | 1.125000e-02 | 0.2065464 | 0.209 |
| 0.2165868 | 0.200 | -6.245005e-18 | 0.1978508 | 0.200 |
| 0.2158218 | 0.200 | -9.714451e-18 | 0.1982908 | 0.200 |
| 0.2157674 | 0.210 | 1.250000e-02 | 0.2084522 | 0.210 |
| 0.2219977 | 0.212 | 1.500000e-02 | 0.2114828 | 0.212 |
| 0.2168732 | 0.185 | -1.875000e-02 | 0.1815553 | 0.185 |
| 0.2173513 | 0.185 | -1.875000e-02 | 0.1794157 | 0.185 |
| 0.2166802 | 0.193 | -8.750000e-03 | 0.1871277 | 0.193 |
| 0.2164864 | 0.192 | -1.000000e-02 | 0.1878552 | 0.192 |
| 0.2213153 | 0.200 | -9.714451e-18 | 0.1977400 | 0.200 |
| 0.2189335 | 0.201 | 1.250000e-03 | 0.1993089 | 0.201 |
| 0.2172693 | 0.196 | -5.000000e-03 | 0.1969627 | 0.196 |
| 0.2168061 | 0.190 | -1.250000e-02 | 0.1865150 | 0.190 |
| 0.2161111 | 0.200 | -1.595946e-17 | 0.1971155 | 0.200 |
| 0.2195626 | 0.202 | 2.500000e-03 | 0.2092047 | 0.202 |
| 0.2130053 | 0.195 | -6.250000e-03 | 0.1922614 | 0.195 |
| 0.2133217 | 0.200 | -6.938894e-18 | 0.1979112 | 0.200 |
| 0.2137489 | 0.188 | -1.500000e-02 | 0.1816979 | 0.188 |
| 0.2150876 | 0.196 | -5.000000e-03 | 0.1906667 | 0.196 |
| 0.2264020 | 0.233 | 4.125000e-02 | 0.2306810 | 0.233 |
| 0.2247049 | 0.224 | 3.000000e-02 | 0.2203098 | 0.224 |

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|---|---|---|---|---|
| 0.2228017 | 0.224 | 3.000000e-02 | 0.2201473 | 0.224 |
| 0.2204899 | 0.220 | 2.500000e-02 | 0.2163414 | 0.220 |
| 0.2205387 | 0.212 | 1.500000e-02 | 0.2087822 | 0.212 |
| 0.2330138 | 0.221 | 2.625000e-02 | 0.2176180 | 0.221 |
| 0.2272738 | 0.215 | 1.875000e-02 | 0.2122686 | 0.215 |
| 0.2278419 | 0.214 | 1.750000e-02 | 0.2133356 | 0.214 |
| 0.2239820 | 0.219 | 2.375000e-02 | 0.2199197 | 0.219 |
| 0.2229884 | 0.212 | 1.500000e-02 | 0.2130478 | 0.212 |
| 0.2256930 | 0.217 | 2.125000e-02 | 0.2163465 | 0.217 |
| 0.2217226 | 0.202 | 2.500000e-03 | 0.2033738 | 0.202 |
| 0.2193078 | 0.196 | -5.000000e-03 | 0.1924584 | 0.196 |
| 0.2197346 | 0.201 | 1.250000e-03 | 0.1988611 | 0.201 |
| 0.2192944 | 0.200 | -9.714451e-18 | 0.1974393 | 0.200 |
| 0.2247208 | 0.202 | 2.500000e-03 | 0.2001283 | 0.202 |
| 0.2207738 | 0.212 | 1.500000e-02 | 0.2085562 | 0.212 |
| 0.2188889 | 0.202 | 2.500000e-03 | 0.1993652 | 0.202 |
| 0.2193692 | 0.206 | 7.500000e-03 | 0.2046190 | 0.206 |
| 0.2167942 | 0.205 | 6.250000e-03 | 0.2046628 | 0.205 |
| 0.2211577 | 0.206 | 7.500000e-03 | 0.2009796 | 0.206 |
| 0.2173476 | 0.199 | -1.250000e-03 | 0.1984272 | 0.199 |
| 0.2139910 | 0.195 | -6.250000e-03 | 0.1937316 | 0.195 |
| 0.2151695 | 0.198 | -2.500000e-03 | 0.1986158 | 0.198 |
| 0.2154852 | 0.191 | -1.125000e-02 | 0.1925975 | 0.191 |
| 0.2446248 | 0.244 | 5.500000e-02 | 0.2374985 | 0.244 |
| 0.2310221 | 0.227 | 3.375000e-02 | 0.2250719 | 0.227 |
| 0.2232945 | 0.218 | 2.250000e-02 | 0.2202560 | 0.218 |
| 0.2230581 | 0.223 | 2.875000e-02 | 0.2263714 | 0.223 |
| 0.2218094 | 0.211 | 1.375000e-02 | 0.2208103 | 0.211 |
| 0.2367505 | 0.249 | 6.125000e-02 | 0.2392071 | 0.249 |
| 0.2307242 | 0.238 | 4.750000e-02 | 0.2368110 | 0.238 |
| 0.2273906 | 0.220 | 2.500000e-02 | 0.2256341 | 0.220 |
| 0.2232768 | 0.200 | -5.551115e-18 | 0.2046158 | 0.200 |
| 0.2174263 | 0.203 | 3.750000e-03 | 0.2114551 | 0.203 |
| 0.2384554 | 0.251 | 6.375000e-02 | 0.2470744 | 0.251 |
| 0.2337062 | 0.234 | 4.250000e-02 | 0.2439665 | 0.234 |
| 0.2283931 | 0.213 | 1.625000e-02 | 0.2266363 | 0.213 |
| 0.2229745 | 0.205 | 6.250000e-03 | 0.2173705 | 0.205 |
| 0.2218470 | 0.207 | 8.750000e-03 | 0.2057156 | 0.207 |
| 0.2359819 | 0.254 | 6.750000e-02 | 0.2423574 | 0.254 |
| 0.2313894 | 0.227 | 3.375000e-02 | 0.2240722 | 0.227 |
| 0.2284365 | 0.219 | 2.375000e-02 | 0.2292567 | 0.219 |
| 0.2238023 | 0.216 | 2.000000e-02 | 0.2287367 | 0.216 |
| 0.2204791 | 0.202 | 2.500000e-03 | 0.2146497 | 0.202 |
| 0.2371424 | 0.261 | 7.625000e-02 | 0.2497876 | 0.261 |
| 0.2328174 | 0.242 | 5.250000e-02 | 0.2380853 | 0.242 |
| 0.2279170 | 0.221 | 2.625000e-02 | 0.2214009 | 0.221 |
| 0.2259457 | 0.220 | 2.500000e-02 | 0.2258791 | 0.220 |
| 0.2232385 | 0.214 | 1.750000e-02 | 0.2155556 | 0.214 |
| 0.2391148 | 0.248 | 6.000000e-02 | 0.2504459 | 0.248 |
| 0.2325913 | 0.224 | 3.000000e-02 | 0.2262325 | 0.224 |
| 0.2278632 | 0.217 | 2.125000e-02 | 0.2152290 | 0.217 |
| 0.2227093 | 0.223 | 2.875000e-02 | 0.2251228 | 0.223 |
| 0.2194538 | 0.210 | 1.250000e-02 | 0.2170307 | 0.210 |
| 0.2371204 | 0.244 | 5.500000e-02 | 0.2422181 | 0.244 |
| 0.2366632 | 0.252 | 6.500000e-02 | 0.2542352 | 0.252 |

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|---|---|---|---|---|
| 0.2281821 | 0.226 | 3.250000e-02 | 0.2243088 | 0.226 |
| 0.2228921 | 0.217 | 2.125000e-02 | 0.2204697 | 0.217 |
| 0.2197377 | 0.208 | 1.000000e-02 | 0.2129353 | 0.208 |
| 0.2406016 | 0.232 | 4.000000e-02 | 0.2276057 | 0.232 |
| 0.2311009 | 0.220 | 2.500000e-02 | 0.2205026 | 0.220 |
| 0.2296527 | 0.208 | 1.000000e-02 | 0.2182622 | 0.208 |
| 0.2253093 | 0.205 | 6.250000e-03 | 0.2112149 | 0.205 |
| 0.2216556 | 0.209 | 1.125000e-02 | 0.2266954 | 0.209 |
| 0.2365327 | 0.253 | 6.625000e-02 | 0.2484185 | 0.253 |
| 0.2336041 | 0.236 | 4.500000e-02 | 0.2360631 | 0.236 |
| 0.2295860 | 0.215 | 1.875000e-02 | 0.2157095 | 0.215 |
| 0.2251515 | 0.207 | 8.750000e-03 | 0.2100142 | 0.207 |
| 0.2218728 | 0.200 | -1.040834e-17 | 0.2060838 | 0.200 |
| 0.2372082 | 0.259 | 7.375000e-02 | 0.2500688 | 0.259 |
| 0.2319068 | 0.247 | 5.875000e-02 | 0.2387550 | 0.247 |
| 0.2281607 | 0.226 | 3.250000e-02 | 0.2241062 | 0.226 |
| 0.2253912 | 0.217 | 2.125000e-02 | 0.2171624 | 0.217 |
| 0.2223995 | 0.209 | 1.125000e-02 | 0.2071955 | 0.209 |
| 0.2186408 | 0.212 | 1.500000e-02 | 0.2074039 | 0.212 |
| 0.2086883 | 0.216 | 2.000000e-02 | 0.2140937 | 0.216 |
| 0.2132115 | 0.214 | 1.750000e-02 | 0.2130461 | 0.214 |
| 0.2123606 | 0.206 | 7.500000e-03 | 0.2034550 | 0.206 |
| 0.2124575 | 0.199 | -1.250000e-03 | 0.1963723 | 0.199 |
| 0.2292357 | 0.215 | 1.875000e-02 | 0.2209095 | 0.215 |
| 0.2186876 | 0.211 | 1.375000e-02 | 0.2176474 | 0.211 |
| 0.2172458 | 0.217 | 2.125000e-02 | 0.2189947 | 0.217 |
| 0.2147783 | 0.220 | 2.500000e-02 | 0.2238205 | 0.220 |
| 0.2131920 | 0.208 | 1.000000e-02 | 0.2065600 | 0.208 |
| 0.2224189 | 0.213 | 1.625000e-02 | 0.2079606 | 0.213 |
| 0.2193877 | 0.210 | 1.250000e-02 | 0.2130258 | 0.210 |
| 0.2192262 | 0.215 | 1.875000e-02 | 0.2217217 | 0.215 |
| 0.2191236 | 0.216 | 2.000000e-02 | 0.2217450 | 0.216 |
| 0.2182662 | 0.204 | 5.000000e-03 | 0.2078177 | 0.204 |
| 0.2258969 | 0.226 | 3.250000e-02 | 0.2268085 | 0.226 |
| 0.2169799 | 0.208 | 1.000000e-02 | 0.2094183 | 0.208 |
| 0.2126487 | 0.202 | 2.500000e-03 | 0.2095965 | 0.202 |
| 0.2115959 | 0.192 | -1.000000e-02 | 0.1981254 | 0.192 |
| 0.2103810 | 0.197 | -3.750000e-03 | 0.2039441 | 0.197 |
| 0.2212117 | 0.228 | 3.500000e-02 | 0.2243642 | 0.228 |
| 0.2149721 | 0.210 | 1.250000e-02 | 0.2123521 | 0.210 |
| 0.2136501 | 0.197 | -3.750000e-03 | 0.2045317 | 0.197 |
| 0.2152349 | 0.195 | -6.250000e-03 | 0.1979160 | 0.195 |
| 0.2140972 | 0.201 | 1.250000e-03 | 0.1991490 | 0.201 |
| 0.2295022 | 0.212 | 1.500000e-02 | 0.2243739 | 0.212 |
| 0.2298628 | 0.244 | 5.500000e-02 | 0.2494829 | 0.244 |
| 0.2254549 | 0.224 | 3.000000e-02 | 0.2231083 | 0.224 |
| 0.2208028 | 0.209 | 1.125000e-02 | 0.2077074 | 0.209 |
| 0.2197535 | 0.218 | 2.250000e-02 | 0.2228612 | 0.218 |
| 0.2279055 | 0.239 | 4.875000e-02 | 0.2363587 | 0.239 |
| 0.2181872 | 0.215 | 1.875000e-02 | 0.2108937 | 0.215 |
| 0.2139886 | 0.201 | 1.250000e-03 | 0.2035510 | 0.201 |
| 0.2161767 | 0.198 | -2.500000e-03 | 0.2040678 | 0.198 |
| 0.2142438 | 0.198 | -2.500000e-03 | 0.1993591 | 0.198 |
| 0.2218787 | 0.203 | 3.750000e-03 | 0.2020489 | 0.203 |
| 0.2155179 | 0.199 | -1.250000e-03 | 0.1963275 | 0.199 |

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| 0.2123557 | 0.193 | -8.750000e-03 | 0.1915231 | 0.193 |
| 0.2119446 | 0.192 | -1.000000e-02 | 0.1891060 | 0.192 |
| 0.2105250 | 0.184 | -2.000000e-02 | 0.1817283 | 0.184 |
| 0.2222112 | 0.221 | 2.625000e-02 | 0.2181284 | 0.221 |
| 0.2183926 | 0.202 | 2.500000e-03 | 0.2014801 | 0.202 |
| 0.2202252 | 0.212 | 1.500000e-02 | 0.2144517 | 0.212 |
| 0.2154875 | 0.209 | 1.125000e-02 | 0.2108433 | 0.209 |
| 0.2169136 | 0.205 | 6.250000e-03 | 0.2061595 | 0.205 |
| 0.2250200 | 0.219 | 2.375000e-02 | 0.2265605 | 0.219 |
| 0.2179745 | 0.224 | 3.000000e-02 | 0.2225625 | 0.224 |
| 0.2133413 | 0.206 | 7.500000e-03 | 0.2087332 | 0.206 |
| 0.2130792 | 0.207 | 8.750000e-03 | 0.2021840 | 0.207 |
| 0.2123613 | 0.202 | 2.500000e-03 | 0.2050595 | 0.202 |
| 0.2261801 | 0.224 | 3.000000e-02 | 0.2201507 | 0.224 |
| 0.2213810 | 0.217 | 2.125000e-02 | 0.2153984 | 0.217 |
| 0.2152945 | 0.216 | 2.000000e-02 | 0.2127358 | 0.216 |
| 0.2150829 | 0.216 | 2.000000e-02 | 0.2139873 | 0.216 |
| 0.2127547 | 0.199 | -1.250000e-03 | 0.2047225 | 0.199 |
| 0.2245282 | 0.223 | 2.875000e-02 | 0.2287103 | 0.223 |
| 0.2210522 | 0.212 | 1.500000e-02 | 0.2101384 | 0.212 |
| 0.2200900 | 0.212 | 1.500000e-02 | 0.2081659 | 0.212 |
| 0.2202847 | 0.216 | 2.000000e-02 | 0.2204222 | 0.216 |
| 0.2195648 | 0.217 | 2.125000e-02 | 0.2151252 | 0.217 |
| 0.2209510 | 0.206 | 7.500000e-03 | 0.2055992 | 0.206 |
| 0.2169283 | 0.201 | 1.250000e-03 | 0.1987623 | 0.201 |
| 0.2176653 | 0.200 | -1.040834e-17 | 0.1969514 | 0.200 |
| 0.2172366 | 0.202 | 2.500000e-03 | 0.1985700 | 0.202 |
| 0.2161070 | 0.198 | -2.500000e-03 | 0.1944916 | 0.198 |
| 0.2219180 | 0.210 | 1.250000e-02 | 0.2102115 | 0.210 |
| 0.2181596 | 0.202 | 2.500000e-03 | 0.2019572 | 0.202 |
| 0.2184596 | 0.200 | -9.714451e-18 | 0.2052344 | 0.200 |
| 0.2189140 | 0.197 | -3.750000e-03 | 0.1969988 | 0.197 |
| 0.2180063 | 0.199 | -1.250000e-03 | 0.1973756 | 0.199 |
| 0.2185090 | 0.221 | 2.625000e-02 | 0.2154289 | 0.221 |
| 0.2151721 | 0.193 | -8.750000e-03 | 0.2011837 | 0.193 |
| 0.2151609 | 0.195 | -6.250000e-03 | 0.1987973 | 0.195 |
| 0.2162272 | 0.194 | -7.500000e-03 | 0.1887614 | 0.194 |
| 0.2152142 | 0.190 | -1.250000e-02 | 0.1903925 | 0.190 |
| 0.2253469 | 0.225 | 3.125000e-02 | 0.2215290 | 0.225 |
| 0.2251641 | 0.204 | 5.000000e-03 | 0.2028760 | 0.204 |
| 0.2243702 | 0.221 | 2.625000e-02 | 0.2186901 | 0.221 |
| 0.2234050 | 0.207 | 8.750000e-03 | 0.2044911 | 0.207 |
| 0.2239937 | 0.210 | 1.250000e-02 | 0.2081616 | 0.210 |
| 0.2242399 | 0.210 | 1.250000e-02 | 0.2072897 | 0.210 |
| 0.2153813 | 0.197 | -3.750000e-03 | 0.2005146 | 0.197 |
| 0.2165037 | 0.194 | -7.500000e-03 | 0.2047887 | 0.194 |
| 0.2169470 | 0.201 | 1.250000e-03 | 0.1948150 | 0.201 |
| 0.2151675 | 0.203 | 3.750000e-03 | 0.1960843 | 0.203 |
| 0.2251150 | 0.204 | 5.000000e-03 | 0.2079392 | 0.204 |
| 0.2218920 | 0.191 | -1.125000e-02 | 0.1883791 | 0.191 |
| 0.2188379 | 0.207 | 8.750000e-03 | 0.2029903 | 0.207 |
| 0.2176785 | 0.201 | 1.250000e-03 | 0.1974980 | 0.201 |
| 0.2159262 | 0.196 | -5.000000e-03 | 0.1926957 | 0.196 |
| 0.2241339 | 0.210 | 1.250000e-02 | 0.2081455 | 0.210 |
| 0.2162610 | 0.196 | -5.000000e-03 | 0.1923196 | 0.196 |

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| 0.2187034 | 0.191 | -1.125000e-02 | 0.1866893 | 0.191 |
| 0.2191949 | 0.209 | 1.125000e-02 | 0.2034672 | 0.209 |
| 0.2197344 | 0.203 | 3.750000e-03 | 0.1986221 | 0.203 |
| 0.2142483 | 0.208 | 1.000000e-02 | 0.2039194 | 0.208 |
| 0.2115605 | 0.187 | -1.625000e-02 | 0.1814111 | 0.187 |
| 0.2111677 | 0.189 | -1.375000e-02 | 0.1894417 | 0.189 |
| 0.2110429 | 0.195 | -6.250000e-03 | 0.1931651 | 0.195 |
| 0.2115844 | 0.191 | -1.125000e-02 | 0.1940137 | 0.191 |
| 0.2194263 | 0.207 | 8.750000e-03 | 0.2044050 | 0.207 |
| 0.2149856 | 0.205 | 6.250000e-03 | 0.2013635 | 0.205 |
| 0.2130251 | 0.204 | 5.000000e-03 | 0.1999909 | 0.204 |
| 0.2122451 | 0.204 | 5.000000e-03 | 0.2032587 | 0.204 |
| 0.2122077 | 0.195 | -6.250000e-03 | 0.1919931 | 0.195 |
| 0.2260346 | 0.224 | 3.000000e-02 | 0.2209833 | 0.224 |
| 0.2265256 | 0.211 | 1.375000e-02 | 0.2042835 | 0.211 |
| 0.2240080 | 0.219 | 2.375000e-02 | 0.2176605 | 0.219 |
| 0.2225465 | 0.218 | 2.250000e-02 | 0.2152623 | 0.218 |
| 0.2225644 | 0.218 | 2.250000e-02 | 0.2155637 | 0.218 |
| 0.2143111 | 0.189 | -1.375000e-02 | 0.1865827 | 0.189 |
| 0.2178149 | 0.194 | -7.500000e-03 | 0.1944325 | 0.194 |
| 0.2171269 | 0.197 | -3.750000e-03 | 0.1944378 | 0.197 |
| 0.2186960 | 0.200 | -6.938894e-18 | 0.1972468 | 0.200 |
| 0.2171114 | 0.197 | -3.750000e-03 | 0.1951718 | 0.197 |
| 0.2197973 | 0.222 | 2.750000e-02 | 0.2198337 | 0.222 |
| 0.2198275 | 0.217 | 2.125000e-02 | 0.2140552 | 0.217 |
| 0.2196221 | 0.207 | 8.750000e-03 | 0.2033728 | 0.207 |
| 0.2194844 | 0.206 | 7.500000e-03 | 0.2015133 | 0.206 |
| 0.2190818 | 0.201 | 1.250000e-03 | 0.1966547 | 0.201 |
| 0.2234624 | 0.216 | 2.000000e-02 | 0.2150143 | 0.216 |
| 0.2166411 | 0.192 | -1.000000e-02 | 0.1988550 | 0.192 |
| 0.2140047 | 0.194 | -7.500000e-03 | 0.1952749 | 0.194 |
| 0.2124495 | 0.188 | -1.500000e-02 | 0.1885648 | 0.188 |
| 0.2131811 | 0.194 | -7.500000e-03 | 0.1918179 | 0.194 |
| 0.2231659 | 0.208 | 1.000000e-02 | 0.2077436 | 0.208 |
| 0.2172951 | 0.201 | 1.250000e-03 | 0.1996676 | 0.201 |
| 0.2159146 | 0.191 | -1.125000e-02 | 0.1897235 | 0.191 |
| 0.2126446 | 0.193 | -8.750000e-03 | 0.1896185 | 0.193 |
| 0.2112960 | 0.189 | -1.375000e-02 | 0.1824039 | 0.189 |
| 0.2135652 | 0.199 | -1.250000e-03 | 0.1980569 | 0.199 |
| 0.2093379 | 0.201 | 1.250000e-03 | 0.1960621 | 0.201 |
| 0.2112799 | 0.197 | -3.750000e-03 | 0.1932999 | 0.197 |
| 0.2088879 | 0.192 | -1.000000e-02 | 0.1950457 | 0.192 |
| 0.2109118 | 0.189 | -1.375000e-02 | 0.1941749 | 0.189 |
| 0.2228670 | 0.205 | 6.250000e-03 | 0.2026023 | 0.205 |
| 0.2172037 | 0.210 | 1.250000e-02 | 0.2086998 | 0.210 |
| 0.2170285 | 0.202 | 2.500000e-03 | 0.1959678 | 0.202 |
| 0.2183179 | 0.204 | 5.000000e-03 | 0.2010574 | 0.204 |
| 0.2182418 | 0.205 | 6.250000e-03 | 0.2029892 | 0.205 |
| 0.2225763 | 0.213 | 1.625000e-02 | 0.2081793 | 0.213 |
| 0.2184617 | 0.213 | 1.625000e-02 | 0.2101055 | 0.213 |
| 0.2160817 | 0.207 | 8.750000e-03 | 0.2032567 | 0.207 |
| 0.2178479 | 0.207 | 8.750000e-03 | 0.2063948 | 0.207 |
| 0.2167988 | 0.208 | 1.000000e-02 | 0.2044854 | 0.208 |
| 0.2186005 | 0.216 | 2.000000e-02 | 0.2103699 | 0.216 |
| 0.2194525 | 0.197 | -3.750000e-03 | 0.1945179 | 0.197 |

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| 0.2164540 | 0.193 | -8.750000e-03 | 0.1849824 | 0.193 |
| 0.2147081 | 0.187 | -1.625000e-02 | 0.1808251 | 0.187 |
| 0.2154776 | 0.188 | -1.500000e-02 | 0.1828215 | 0.188 |
| 0.2159999 | 0.219 | 2.375000e-02 | 0.2158098 | 0.219 |
| 0.2156625 | 0.207 | 8.750000e-03 | 0.2048638 | 0.207 |
| 0.2172117 | 0.212 | 1.500000e-02 | 0.2087230 | 0.212 |
| 0.2138104 | 0.208 | 1.000000e-02 | 0.2061858 | 0.208 |
| 0.2156620 | 0.207 | 8.750000e-03 | 0.2052188 | 0.207 |
| 0.2259850 | 0.215 | 1.875000e-02 | 0.2111993 | 0.215 |
| 0.2211819 | 0.217 | 2.125000e-02 | 0.2134049 | 0.217 |
| 0.2204743 | 0.218 | 2.250000e-02 | 0.2162388 | 0.218 |
| 0.2196458 | 0.220 | 2.500000e-02 | 0.2198954 | 0.220 |
| 0.2192947 | 0.218 | 2.250000e-02 | 0.2173364 | 0.218 |
| 0.2266130 | 0.212 | 1.500000e-02 | 0.2136050 | 0.212 |
| 0.2250844 | 0.205 | 6.250000e-03 | 0.2131583 | 0.205 |
| 0.2217841 | 0.197 | -3.750000e-03 | 0.1966749 | 0.197 |
| 0.2214899 | 0.199 | -1.250000e-03 | 0.1977709 | 0.199 |
| 0.2203802 | 0.204 | 5.000000e-03 | 0.2036024 | 0.204 |
| 0.2250234 | 0.210 | 1.250000e-02 | 0.2067367 | 0.210 |
| 0.2269014 | 0.206 | 7.500000e-03 | 0.2018968 | 0.206 |
| 0.2209999 | 0.199 | -1.250000e-03 | 0.1941027 | 0.199 |
| 0.2207992 | 0.199 | -1.250000e-03 | 0.1937113 | 0.199 |
| 0.2204015 | 0.198 | -2.500000e-03 | 0.1933616 | 0.198 |
| 0.2152900 | 0.193 | -8.750000e-03 | 0.1903016 | 0.193 |
| 0.2147347 | 0.205 | 6.250000e-03 | 0.2066431 | 0.205 |
| 0.2151158 | 0.201 | 1.250000e-03 | 0.1979902 | 0.201 |
| 0.2158473 | 0.200 | -1.734723e-17 | 0.1960983 | 0.200 |
| 0.2154519 | 0.195 | -6.250000e-03 | 0.1913092 | 0.195 |
| 0.2148758 | 0.189 | -1.375000e-02 | 0.1849656 | 0.189 |
| 0.2120329 | 0.179 | -2.625000e-02 | 0.1791084 | 0.179 |
| 0.2096373 | 0.183 | -2.125000e-02 | 0.1789474 | 0.183 |
| 0.2100827 | 0.185 | -1.875000e-02 | 0.1819778 | 0.185 |
| 0.2114167 | 0.191 | -1.125000e-02 | 0.1880615 | 0.191 |
| 0.2210004 | 0.216 | 2.000000e-02 | 0.2131798 | 0.216 |
| 0.2187855 | 0.211 | 1.375000e-02 | 0.2068425 | 0.211 |
| 0.2163721 | 0.207 | 8.750000e-03 | 0.2031730 | 0.207 |
| 0.2159710 | 0.208 | 1.000000e-02 | 0.2046194 | 0.208 |
| 0.2149262 | 0.204 | 5.000000e-03 | 0.2002145 | 0.204 |
| 0.2228298 | 0.220 | 2.500000e-02 | 0.2175557 | 0.220 |
| 0.2189754 | 0.203 | 3.750000e-03 | 0.2004602 | 0.203 |
| 0.2183200 | 0.204 | 5.000000e-03 | 0.2198826 | 0.204 |
| 0.2183103 | 0.203 | 3.750000e-03 | 0.2074747 | 0.203 |
| 0.2162329 | 0.205 | 6.250000e-03 | 0.2101146 | 0.205 |
| 0.2140347 | 0.193 | -8.750000e-03 | 0.1934401 | 0.193 |
| 0.2166241 | 0.202 | 2.500000e-03 | 0.2082615 | 0.202 |
| 0.2155014 | 0.197 | -3.750000e-03 | 0.1948730 | 0.197 |
| 0.2156409 | 0.193 | -8.750000e-03 | 0.1909040 | 0.193 |
| 0.2153983 | 0.197 | -3.750000e-03 | 0.1954665 | 0.197 |
| 0.2159348 | 0.219 | 2.375000e-02 | 0.2153273 | 0.219 |
| 0.2196045 | 0.207 | 8.750000e-03 | 0.2024985 | 0.207 |
| 0.2189498 | 0.213 | 1.625000e-02 | 0.2094642 | 0.213 |
| 0.2198827 | 0.209 | 1.125000e-02 | 0.2060623 | 0.209 |
| 0.2190713 | 0.206 | 7.500000e-03 | 0.2032478 | 0.206 |

| Mean_Specificity | Mean_Pos_Pred_Value | Mean_Neg_Pred_Value | Mean_Precision |
|---|---|---|---|
| 0.81175 | 0.2387100 | 0.8125563 | 0.2387100 |

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|---|---|---|---|
| 0.80825 | 0.2277826 | 0.8087348 | 0.2277826 |
| 0.80700 | 0.2274336 | 0.8072635 | 0.2274336 |
| 0.80625 | 0.2272636 | 0.8061586 | 0.2272636 |
| 0.80775 | 0.2344315 | 0.8075554 | 0.2344315 |
| 0.81375 | 0.2547062 | 0.8145977 | 0.2547062 |
| 0.81150 | 0.2471288 | 0.8118193 | 0.2471288 |
| 0.80675 | 0.2317502 | 0.8067141 | 0.2317502 |
| 0.80250 | 0.2129675 | 0.8023974 | 0.2129675 |
| 0.80075 | 0.2065979 | 0.8006093 | 0.2065979 |
| 0.81800 | 0.2702748 | 0.8191015 | 0.2702748 |
| 0.81050 | 0.2434176 | 0.8107652 | 0.2434176 |
| 0.80550 | 0.2239098 | 0.8056048 | 0.2239098 |
| 0.80300 | 0.2127425 | 0.8031006 | 0.2127425 |
| 0.80100 | 0.2036221 | 0.8010037 | 0.2036221 |
| 0.81425 | 0.2450211 | 0.8158562 | 0.2450211 |
| 0.81000 | 0.2353998 | 0.8105951 | 0.2353998 |
| 0.80750 | 0.2290304 | 0.8077133 | 0.2290304 |
| 0.80300 | 0.2158663 | 0.8028792 | 0.2158663 |
| 0.80100 | 0.2062737 | 0.8008900 | 0.2062737 |
| 0.81800 | 0.2599808 | 0.8198968 | 0.2599808 |
| 0.81175 | 0.2364930 | 0.8127194 | 0.2364930 |
| 0.81025 | 0.2350653 | 0.8109077 | 0.2350653 |
| 0.80650 | 0.2250258 | 0.8067583 | 0.2250258 |
| 0.80675 | 0.2244708 | 0.8070610 | 0.2244708 |
| 0.81200 | 0.2445431 | 0.8127708 | 0.2445431 |
| 0.80800 | 0.2273684 | 0.8084894 | 0.2273684 |
| 0.80575 | 0.2250239 | 0.8057350 | 0.2250239 |
| 0.80275 | 0.2124155 | 0.8027307 | 0.2124155 |
| 0.80625 | 0.2257345 | 0.8062403 | 0.2257345 |
| 0.81350 | 0.2504571 | 0.8144414 | 0.2504571 |
| 0.81100 | 0.2414672 | 0.8115765 | 0.2414672 |
| 0.80575 | 0.2259744 | 0.8058800 | 0.2259744 |
| 0.80450 | 0.2187552 | 0.8045875 | 0.2187552 |
| 0.80475 | 0.2169849 | 0.8049160 | 0.2169849 |
| 0.81575 | 0.2532008 | 0.8172456 | 0.2532008 |
| 0.80850 | 0.2310968 | 0.8088503 | 0.2310968 |
| 0.80650 | 0.2285519 | 0.8065660 | 0.2285519 |
| 0.80575 | 0.2234368 | 0.8058395 | 0.2234368 |
| 0.80425 | 0.2174510 | 0.8042141 | 0.2174510 |
| 0.81525 | 0.2447458 | 0.8168157 | 0.2447458 |
| 0.80925 | 0.2310332 | 0.8099655 | 0.2310332 |
| 0.80700 | 0.2308729 | 0.8071810 | 0.2308729 |
| 0.80125 | 0.2080264 | 0.8011453 | 0.2080264 |
| 0.80275 | 0.2161174 | 0.8025342 | 0.2161174 |
| 0.81750 | 0.2611239 | 0.8192486 | 0.2611239 |
| 0.81175 | 0.2388762 | 0.8127074 | 0.2388762 |
| 0.80900 | 0.2276320 | 0.8097410 | 0.2276320 |
| 0.80700 | 0.2237478 | 0.8073882 | 0.2237478 |
| 0.80450 | 0.2166812 | 0.8046411 | 0.2166812 |
| 0.80275 | 0.2092082 | 0.8029539 | 0.2092082 |
| 0.80250 | 0.2068238 | 0.8026757 | 0.2068238 |
| 0.80300 | 0.2112684 | 0.8031470 | 0.2112684 |
| 0.80125 | 0.2069395 | 0.8011537 | 0.2069395 |
| 0.80225 | 0.2105589 | 0.8022090 | 0.2105589 |
| 0.80850 | 0.2289481 | 0.8090359 | 0.2289481 |

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|---|---|---|---|
| 0.80625 | 0.2243912 | 0.8064467 | 0.2243912 |
| 0.80625 | 0.2192976 | 0.8065970 | 0.2192976 |
| 0.80350 | 0.2138418 | 0.8035465 | 0.2138418 |
| 0.80250 | 0.2100606 | 0.8024839 | 0.2100606 |
| 0.80675 | 0.2243340 | 0.8070771 | 0.2243340 |
| 0.79900 | 0.1947020 | 0.7990322 | 0.1947020 |
| 0.79775 | 0.1899438 | 0.7977648 | 0.1899438 |
| 0.79700 | 0.1868559 | 0.7970566 | 0.1868559 |
| 0.79725 | 0.1921172 | 0.7970315 | 0.1921172 |
| 0.80425 | 0.2131074 | 0.8045899 | 0.2131074 |
| 0.80125 | 0.2060070 | 0.8012032 | 0.2060070 |
| 0.80250 | 0.2068819 | 0.8026488 | 0.2068819 |
| 0.79875 | 0.1923262 | 0.7988337 | 0.1923262 |
| 0.80100 | 0.2004306 | 0.8010797 | 0.2004306 |
| 0.80725 | 0.2224651 | 0.8077831 | 0.2224651 |
| 0.80025 | 0.1969166 | 0.8005536 | 0.1969166 |
| 0.79850 | 0.1884877 | 0.7987854 | 0.1884877 |
| 0.80200 | 0.2081212 | 0.8020813 | 0.2081212 |
| 0.80075 | 0.2011586 | 0.8009287 | 0.2011586 |
| 0.80950 | 0.2423063 | 0.8093992 | 0.2423063 |
| 0.81050 | 0.2417794 | 0.8106312 | 0.2417794 |
| 0.80525 | 0.2213049 | 0.8052680 | 0.2213049 |
| 0.80250 | 0.2081207 | 0.8025795 | 0.2081207 |
| 0.80275 | 0.2143827 | 0.8025630 | 0.2143827 |
| 0.80400 | 0.2121288 | 0.8042092 | 0.2121288 |
| 0.80100 | 0.2010369 | 0.8011169 | 0.2010369 |
| 0.80225 | 0.2078718 | 0.8022514 | 0.2078718 |
| 0.80225 | 0.2100274 | 0.8021854 | 0.2100274 |
| 0.80225 | 0.2099399 | 0.8020759 | 0.2099399 |
| 0.80050 | 0.1959303 | 0.8008585 | 0.1959303 |
| 0.80075 | 0.1986233 | 0.8010059 | 0.1986233 |
| 0.79825 | 0.1926383 | 0.7982583 | 0.1926383 |
| 0.80100 | 0.2013690 | 0.8011372 | 0.2013690 |
| 0.79725 | 0.1879794 | 0.7972950 | 0.1879794 |
| 0.80675 | 0.2227928 | 0.8071072 | 0.2227928 |
| 0.80025 | 0.2017094 | 0.8001806 | 0.2017094 |
| 0.79875 | 0.1949101 | 0.7986315 | 0.1949101 |
| 0.79900 | 0.1948755 | 0.7989787 | 0.1948755 |
| 0.79775 | 0.1890300 | 0.7977891 | 0.1890300 |
| 0.80450 | 0.2127755 | 0.8050487 | 0.2127755 |
| 0.80050 | 0.2022603 | 0.8005335 | 0.2022603 |
| 0.79900 | 0.1934694 | 0.7990940 | 0.1934694 |
| 0.79875 | 0.1876971 | 0.7990743 | 0.1876971 |
| 0.79775 | 0.1850642 | 0.7980155 | 0.1850642 |
| 0.80450 | 0.2142526 | 0.8047548 | 0.2142526 |
| 0.80575 | 0.2208271 | 0.8060322 | 0.2208271 |
| 0.80550 | 0.2234433 | 0.8056604 | 0.2234433 |
| 0.80275 | 0.2101893 | 0.8029843 | 0.2101893 |
| 0.80475 | 0.2175151 | 0.8049617 | 0.2175151 |
| 0.80675 | 0.2261021 | 0.8070021 | 0.2261021 |
| 0.80425 | 0.2170267 | 0.8042368 | 0.2170267 |
| 0.80600 | 0.2277559 | 0.8060594 | 0.2277559 |
| 0.80625 | 0.2294788 | 0.8061103 | 0.2294788 |
| 0.80325 | 0.2119057 | 0.8033552 | 0.2119057 |
| 0.80450 | 0.2174438 | 0.8046177 | 0.2174438 |

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|---|---|---|---|
| 0.80550 | 0.2200584 | 0.8059094 | 0.2200584 |
| 0.80250 | 0.2051828 | 0.8028419 | 0.2051828 |
| 0.80325 | 0.2122018 | 0.8033994 | 0.2122018 |
| 0.80275 | 0.2094824 | 0.8029491 | 0.2094824 |
| 0.80225 | 0.2046806 | 0.8025681 | 0.2046806 |
| 0.80500 | 0.2234394 | 0.8050591 | 0.2234394 |
| 0.80400 | 0.2191004 | 0.8039626 | 0.2191004 |
| 0.80075 | 0.2015357 | 0.8008202 | 0.2015357 |
| 0.80000 | 0.1975719 | 0.8001902 | 0.1975719 |
| 0.80400 | 0.2131477 | 0.8043279 | 0.2131477 |
| 0.80300 | 0.2059048 | 0.8033649 | 0.2059048 |
| 0.80125 | 0.2015303 | 0.8015157 | 0.2015303 |
| 0.80025 | 0.1968208 | 0.8004621 | 0.1968208 |
| 0.80100 | 0.1991028 | 0.8013137 | 0.1991028 |
| 0.80800 | 0.2302841 | 0.8081913 | 0.2302841 |
| 0.80225 | 0.2076422 | 0.8023946 | 0.2076422 |
| 0.80750 | 0.2275005 | 0.8077689 | 0.2275005 |
| 0.80250 | 0.2115155 | 0.8024399 | 0.2115155 |
| 0.80025 | 0.2029439 | 0.8001705 | 0.2029439 |
| 0.80200 | 0.2096819 | 0.8018943 | 0.2096819 |
| 0.80275 | 0.2156627 | 0.8025893 | 0.2156627 |
| 0.80275 | 0.2105608 | 0.8027678 | 0.2105608 |
| 0.80075 | 0.1969226 | 0.8011078 | 0.1969226 |
| 0.79850 | 0.1903042 | 0.7986460 | 0.1903042 |
| 0.80100 | 0.2023569 | 0.8011394 | 0.2023569 |
| 0.80275 | 0.2087741 | 0.8030375 | 0.2087741 |
| 0.79800 | 0.1924299 | 0.7980653 | 0.1924299 |
| 0.80025 | 0.2040879 | 0.8000923 | 0.2040879 |
| 0.80025 | 0.2025135 | 0.8002279 | 0.2025135 |
| 0.80650 | 0.2263499 | 0.8066834 | 0.2263499 |
| 0.80350 | 0.2145576 | 0.8035762 | 0.2145576 |
| 0.80300 | 0.2106044 | 0.8031981 | 0.2106044 |
| 0.80300 | 0.2091909 | 0.8032430 | 0.2091909 |
| 0.80325 | 0.2115174 | 0.8034597 | 0.2115174 |
| 0.80425 | 0.2107681 | 0.8047088 | 0.2107681 |
| 0.79925 | 0.1963246 | 0.7993436 | 0.1963246 |
| 0.80150 | 0.2023925 | 0.8017774 | 0.2023925 |
| 0.79950 | 0.1957348 | 0.7997125 | 0.1957348 |
| 0.79900 | 0.1924378 | 0.7992962 | 0.1924378 |
| 0.80625 | 0.2268714 | 0.8061812 | 0.2268714 |
| 0.80375 | 0.2178438 | 0.8037326 | 0.2178438 |
| 0.80125 | 0.2073041 | 0.8010235 | 0.2073041 |
| 0.80375 | 0.2169144 | 0.8035890 | 0.2169144 |
| 0.80250 | 0.2082442 | 0.8025517 | 0.2082442 |
| 0.80125 | 0.2057614 | 0.8012070 | 0.2057614 |
| 0.80275 | 0.2120625 | 0.8027190 | 0.2120625 |
| 0.80300 | 0.2138444 | 0.8029433 | 0.2138444 |
| 0.80150 | 0.2043534 | 0.8016446 | 0.2043534 |
| 0.80125 | 0.2017597 | 0.8014796 | 0.2017597 |
| 0.80225 | 0.2057486 | 0.8025036 | 0.2057486 |
| 0.80175 | 0.2042652 | 0.8020519 | 0.2042652 |
| 0.80000 | 0.1984011 | 0.8000590 | 0.1984011 |
| 0.80150 | 0.2048472 | 0.8015232 | 0.2048472 |
| 0.80150 | 0.2044272 | 0.8015582 | 0.2044272 |
| 0.80250 | 0.2072296 | 0.8027580 | 0.2072296 |

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| 0.79700 | 0.1828352 | 0.7972864 | 0.1828352 |
| 0.79750 | 0.1883132 | 0.7976196 | 0.1883132 |
| 0.79725 | 0.1877314 | 0.7973250 | 0.1877314 |
| 0.79825 | 0.1896445 | 0.7984271 | 0.1896445 |
| 0.80650 | 0.2267485 | 0.8067597 | 0.2267485 |
| 0.79700 | 0.1813489 | 0.7974196 | 0.1813489 |
| 0.79825 | 0.1869165 | 0.7987102 | 0.1869165 |
| 0.79750 | 0.1834014 | 0.7979845 | 0.1834014 |
| 0.79800 | 0.1870793 | 0.7983894 | 0.1870793 |
| 0.80375 | 0.2125852 | 0.8039037 | 0.2125852 |
| 0.80350 | 0.2136552 | 0.8035942 | 0.2136552 |
| 0.80325 | 0.2099421 | 0.8035649 | 0.2099421 |
| 0.80425 | 0.2126810 | 0.8046943 | 0.2126810 |
| 0.80225 | 0.2079611 | 0.8024175 | 0.2079611 |
| 0.80050 | 0.2031401 | 0.8004778 | 0.2031401 |
| 0.80050 | 0.2029536 | 0.8003503 | 0.2029536 |
| 0.79925 | 0.1947805 | 0.7993720 | 0.1947805 |
| 0.79975 | 0.1980046 | 0.7998358 | 0.1980046 |
| 0.79900 | 0.1933795 | 0.7991487 | 0.1933795 |
| 0.80350 | 0.2134372 | 0.8035633 | 0.2134372 |
| 0.80375 | 0.2145041 | 0.8038754 | 0.2145041 |
| 0.80175 | 0.2077410 | 0.8017510 | 0.2077410 |
| 0.80150 | 0.2075024 | 0.8014523 | 0.2075024 |
| 0.79825 | 0.1937067 | 0.7982581 | 0.1937067 |
| 0.80175 | 0.2040656 | 0.8020151 | 0.2040656 |
| 0.80050 | 0.1990169 | 0.8008132 | 0.1990169 |
| 0.80050 | 0.2006545 | 0.8006370 | 0.2006545 |
| 0.80075 | 0.2011951 | 0.8009344 | 0.2011951 |
| 0.80075 | 0.2024254 | 0.8008198 | 0.2024254 |
| 0.80325 | 0.2073781 | 0.8036202 | 0.2073781 |
| 0.79950 | 0.1924057 | 0.7998126 | 0.1924057 |
| 0.79875 | 0.1897747 | 0.7991166 | 0.1897747 |
| 0.79600 | 0.1777795 | 0.7963785 | 0.1777795 |
| 0.79550 | 0.1761868 | 0.7958464 | 0.1761868 |
| 0.79850 | 0.1923404 | 0.7986388 | 0.1923404 |
| 0.80050 | 0.2031482 | 0.8004612 | 0.2031482 |
| 0.80300 | 0.2127876 | 0.8030858 | 0.2127876 |
| 0.80300 | 0.2140073 | 0.8029806 | 0.2140073 |
| 0.80325 | 0.2139509 | 0.8032761 | 0.2139509 |
| 0.80250 | 0.2063886 | 0.8027130 | 0.2063886 |
| 0.80225 | 0.2090129 | 0.8021977 | 0.2090129 |
| 0.80000 | 0.2004375 | 0.7999931 | 0.2004375 |
| 0.80000 | 0.2007654 | 0.7999261 | 0.2007654 |
| 0.80250 | 0.2115819 | 0.8024148 | 0.2115819 |
| 0.80300 | 0.2145306 | 0.8028607 | 0.2145306 |
| 0.79625 | 0.1850089 | 0.7961563 | 0.1850089 |
| 0.79625 | 0.1831623 | 0.7963194 | 0.1831623 |
| 0.79825 | 0.1913625 | 0.7983197 | 0.1913625 |
| 0.79800 | 0.1891061 | 0.7980807 | 0.1891061 |
| 0.80000 | 0.1954275 | 0.8003010 | 0.1954275 |
| 0.80025 | 0.1975227 | 0.8005698 | 0.1975227 |
| 0.79900 | 0.1903261 | 0.7993596 | 0.1903261 |
| 0.79750 | 0.1882992 | 0.7976749 | 0.1882992 |
| 0.80000 | 0.1998245 | 0.8001148 | 0.1998245 |
| 0.80050 | 0.1983926 | 0.8006681 | 0.1983926 |

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| 0.79875 | 0.1886903 | 0.7990578 | 0.1886903 |
| 0.80000 | 0.1942373 | 0.8003508 | 0.1942373 |
| 0.79700 | 0.1816409 | 0.7973566 | 0.1816409 |
| 0.79900 | 0.1907152 | 0.7993060 | 0.1907152 |
| 0.80825 | 0.2356087 | 0.8082552 | 0.2356087 |
| 0.80600 | 0.2197497 | 0.8064357 | 0.2197497 |
| 0.80600 | 0.2217984 | 0.8062492 | 0.2217984 |
| 0.80500 | 0.2177865 | 0.8052151 | 0.2177865 |
| 0.80300 | 0.2108887 | 0.8031174 | 0.2108887 |
| 0.80525 | 0.2205994 | 0.8054439 | 0.2205994 |
| 0.80375 | 0.2158062 | 0.8038048 | 0.2158062 |
| 0.80350 | 0.2186396 | 0.8033069 | 0.2186396 |
| 0.80475 | 0.2233485 | 0.8045117 | 0.2233485 |
| 0.80300 | 0.2153047 | 0.8028498 | 0.2153047 |
| 0.80425 | 0.2108999 | 0.8047113 | 0.2108999 |
| 0.80050 | 0.1987913 | 0.8007518 | 0.1987913 |
| 0.79900 | 0.1927744 | 0.7992638 | 0.1927744 |
| 0.80025 | 0.2006160 | 0.8003605 | 0.2006160 |
| 0.80000 | 0.1998998 | 0.8000943 | 0.1998998 |
| 0.80050 | 0.2040627 | 0.8004099 | 0.2040627 |
| 0.80300 | 0.2107641 | 0.8032100 | 0.2107641 |
| 0.80050 | 0.2028650 | 0.8005661 | 0.2028650 |
| 0.80150 | 0.2099444 | 0.8014279 | 0.2099444 |
| 0.80125 | 0.2095684 | 0.8010454 | 0.2095684 |
| 0.80150 | 0.2008492 | 0.8018523 | 0.2008492 |
| 0.79975 | 0.1951727 | 0.8000546 | 0.1951727 |
| 0.79875 | 0.1899588 | 0.7991397 | 0.1899588 |
| 0.79950 | 0.1970206 | 0.7996972 | 0.1970206 |
| 0.79775 | 0.1907561 | 0.7978376 | 0.1907561 |
| 0.81100 | 0.2404968 | 0.8114279 | 0.2404968 |
| 0.80675 | 0.2287161 | 0.8067390 | 0.2287161 |
| 0.80450 | 0.2166250 | 0.8046147 | 0.2166250 |
| 0.80575 | 0.2214970 | 0.8059152 | 0.2214970 |
| 0.80275 | 0.2120033 | 0.8027080 | 0.2120033 |
| 0.81225 | 0.2458704 | 0.8128852 | 0.2458704 |
| 0.80950 | 0.2424083 | 0.8094229 | 0.2424083 |
| 0.80500 | 0.2261000 | 0.8047279 | 0.2261000 |
| 0.80000 | 0.2018111 | 0.7998550 | 0.2018111 |
| 0.80075 | 0.2073102 | 0.8004782 | 0.2073102 |
| 0.81275 | 0.2537117 | 0.8131527 | 0.2537117 |
| 0.80850 | 0.2344325 | 0.8087572 | 0.2344325 |
| 0.80325 | 0.2165277 | 0.8031283 | 0.2165277 |
| 0.80125 | 0.2065099 | 0.8011288 | 0.2065099 |
| 0.80175 | 0.2089016 | 0.8017155 | 0.2089016 |
| 0.81350 | 0.2467125 | 0.8144949 | 0.2467125 |
| 0.80675 | 0.2235374 | 0.8070519 | 0.2235374 |
| 0.80475 | 0.2221393 | 0.8046741 | 0.2221393 |
| 0.80400 | 0.2197113 | 0.8038527 | 0.2197113 |
| 0.80050 | 0.2046946 | 0.8002368 | 0.2046946 |
| 0.81525 | 0.2560049 | 0.8166473 | 0.2560049 |
| 0.81050 | 0.2331799 | 0.8113729 | 0.2331799 |
| 0.80525 | 0.2188578 | 0.8055129 | 0.2188578 |
| 0.80500 | 0.2150637 | 0.8054320 | 0.2150637 |
| 0.80350 | 0.2129328 | 0.8036836 | 0.2129328 |
| 0.81200 | 0.2410868 | 0.8126837 | 0.2410868 |

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| 0.80600 | 0.2245258 | 0.8060574 | 0.2245258 |
| 0.80425 | 0.2169263 | 0.8042864 | 0.2169263 |
| 0.80575 | 0.2217451 | 0.8059398 | 0.2217451 |
| 0.80250 | 0.2139228 | 0.8023491 | 0.2139228 |
| 0.81100 | 0.2428757 | 0.8114319 | 0.2428757 |
| 0.81300 | 0.2592378 | 0.8129290 | 0.2592378 |
| 0.80650 | 0.2308153 | 0.8063137 | 0.2308153 |
| 0.80425 | 0.2234824 | 0.8039622 | 0.2234824 |
| 0.80200 | 0.2156592 | 0.8015945 | 0.2156592 |
| 0.80800 | 0.2252149 | 0.8088223 | 0.2252149 |
| 0.80500 | 0.2196658 | 0.8050998 | 0.2196658 |
| 0.80200 | 0.2036365 | 0.8021916 | 0.2036365 |
| 0.80125 | 0.2051684 | 0.8012264 | 0.2051684 |
| 0.80225 | 0.2123333 | 0.8020529 | 0.2123333 |
| 0.81325 | 0.2464065 | 0.8142327 | 0.2464065 |
| 0.80900 | 0.2332725 | 0.8093493 | 0.2332725 |
| 0.80375 | 0.2190022 | 0.8036209 | 0.2190022 |
| 0.80175 | 0.2113770 | 0.8016493 | 0.2113770 |
| 0.80000 | 0.2044051 | 0.7997590 | 0.2044051 |
| 0.81475 | 0.2522162 | 0.8160796 | 0.2522162 |
| 0.81175 | 0.2387898 | 0.8126378 | 0.2387898 |
| 0.80650 | 0.2221525 | 0.8068910 | 0.2221525 |
| 0.80425 | 0.2115302 | 0.8046443 | 0.2115302 |
| 0.80225 | 0.2084643 | 0.8023488 | 0.2084643 |
| 0.80300 | 0.2074860 | 0.8032100 | 0.2074860 |
| 0.80400 | 0.2166113 | 0.8039738 | 0.2166113 |
| 0.80350 | 0.2162384 | 0.8033813 | 0.2162384 |
| 0.80150 | 0.2065191 | 0.8014569 | 0.2065191 |
| 0.79975 | 0.1984253 | 0.7998085 | 0.1984253 |
| 0.80375 | 0.2151396 | 0.8037763 | 0.2151396 |
| 0.80275 | 0.2107525 | 0.8028832 | 0.2107525 |
| 0.80425 | 0.2187102 | 0.8041982 | 0.2187102 |
| 0.80500 | 0.2216735 | 0.8049972 | 0.2216735 |
| 0.80200 | 0.2109470 | 0.8017775 | 0.2109470 |
| 0.80325 | 0.2099882 | 0.8034503 | 0.2099882 |
| 0.80250 | 0.2100275 | 0.8024801 | 0.2100275 |
| 0.80375 | 0.2199565 | 0.8034856 | 0.2199565 |
| 0.80400 | 0.2188168 | 0.8038700 | 0.2188168 |
| 0.80100 | 0.2067626 | 0.8008255 | 0.2067626 |
| 0.80650 | 0.2236166 | 0.8067007 | 0.2236166 |
| 0.80200 | 0.2035061 | 0.8021973 | 0.2035061 |
| 0.80050 | 0.1965299 | 0.8007501 | 0.1965299 |
| 0.79800 | 0.1875818 | 0.7982020 | 0.1875818 |
| 0.79925 | 0.1922924 | 0.7994830 | 0.1922924 |
| 0.80700 | 0.2192951 | 0.8074594 | 0.2192951 |
| 0.80250 | 0.2060895 | 0.8027022 | 0.2060895 |
| 0.79925 | 0.1969697 | 0.7992244 | 0.1969697 |
| 0.79875 | 0.1928646 | 0.7988664 | 0.1928646 |
| 0.80025 | 0.2019167 | 0.8001954 | 0.2019167 |
| 0.80300 | 0.2139214 | 0.8028988 | 0.2139214 |
| 0.81100 | 0.2454842 | 0.8109832 | 0.2454842 |
| 0.80600 | 0.2260029 | 0.8059125 | 0.2260029 |
| 0.80225 | 0.2112835 | 0.8020588 | 0.2112835 |
| 0.80450 | 0.2205461 | 0.8043438 | 0.2205461 |
| 0.80975 | 0.2385771 | 0.8098938 | 0.2385771 |

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|---|---|---|---|
| 0.80375 | 0.2125254 | 0.8039658 | 0.2125254 |
| 0.80025 | 0.2002425 | 0.8001643 | 0.2002425 |
| 0.79950 | 0.1997066 | 0.7992497 | 0.1997066 |
| 0.79950 | 0.1955709 | 0.7995059 | 0.1955709 |
| 0.80075 | 0.2012251 | 0.8009772 | 0.2012251 |
| 0.79975 | 0.1978398 | 0.7998208 | 0.1978398 |
| 0.79825 | 0.1946672 | 0.7982068 | 0.1946672 |
| 0.79800 | 0.1906639 | 0.7980754 | 0.1906639 |
| 0.79600 | 0.1826529 | 0.7959957 | 0.1826529 |
| 0.80525 | 0.2199970 | 0.8053626 | 0.2199970 |
| 0.80050 | 0.2032750 | 0.8003611 | 0.2032750 |
| 0.80300 | 0.2122199 | 0.8029833 | 0.2122199 |
| 0.80225 | 0.2087902 | 0.8022313 | 0.2087902 |
| 0.80125 | 0.2054861 | 0.8011268 | 0.2054861 |
| 0.80475 | 0.2135072 | 0.8050766 | 0.2135072 |
| 0.80600 | 0.2186440 | 0.8064158 | 0.2186440 |
| 0.80150 | 0.1986654 | 0.8019066 | 0.1986654 |
| 0.80175 | 0.2043678 | 0.8019270 | 0.2043678 |
| 0.80050 | 0.1997755 | 0.8005784 | 0.1997755 |
| 0.80600 | 0.2211172 | 0.8062750 | 0.2211172 |
| 0.80425 | 0.2172097 | 0.8042030 | 0.2172097 |
| 0.80400 | 0.2132512 | 0.8042390 | 0.2132512 |
| 0.80400 | 0.2160124 | 0.8040467 | 0.2160124 |
| 0.79975 | 0.1971599 | 0.7997695 | 0.1971599 |
| 0.80575 | 0.2268897 | 0.8056084 | 0.2268897 |
| 0.80300 | 0.2130208 | 0.8029570 | 0.2130208 |
| 0.80300 | 0.2099212 | 0.8032411 | 0.2099212 |
| 0.80400 | 0.2187974 | 0.8038596 | 0.2187974 |
| 0.80425 | 0.2182562 | 0.8042347 | 0.2182562 |
| 0.80150 | 0.2018639 | 0.8017051 | 0.2018639 |
| 0.80025 | 0.1935786 | 0.8006052 | 0.1935786 |
| 0.80000 | 0.1979967 | 0.8001123 | 0.1979967 |
| 0.80050 | 0.1984127 | 0.8006504 | 0.1984127 |
| 0.79950 | 0.1944621 | 0.7996335 | 0.1944621 |
| 0.80250 | 0.2078827 | 0.8026619 | 0.2078827 |
| 0.80050 | 0.1986780 | 0.8007556 | 0.1986780 |
| 0.80000 | 0.1967896 | 0.8002102 | 0.1967896 |
| 0.79925 | 0.1948108 | 0.7993491 | 0.1948108 |
| 0.79975 | 0.1972009 | 0.7998368 | 0.1972009 |
| 0.80525 | 0.2182227 | 0.8055505 | 0.2182227 |
| 0.79825 | 0.1927455 | 0.7982896 | 0.1927455 |
| 0.79875 | 0.1935760 | 0.7988580 | 0.1935760 |
| 0.79850 | 0.1940957 | 0.7985412 | 0.1940957 |
| 0.79750 | 0.1855694 | 0.7977162 | 0.1855694 |
| 0.80625 | 0.2209014 | 0.8065116 | 0.2209014 |
| 0.80100 | 0.2061133 | 0.8008826 | 0.2061133 |
| 0.80525 | 0.2205519 | 0.8052848 | 0.2205519 |
| 0.80175 | 0.2063842 | 0.8017885 | 0.2063842 |
| 0.80250 | 0.2105890 | 0.8024587 | 0.2105890 |
| 0.80250 | 0.2110967 | 0.8025491 | 0.2110967 |
| 0.79925 | 0.1942358 | 0.7993410 | 0.1942358 |
| 0.79850 | 0.1904493 | 0.7985960 | 0.1904493 |
| 0.80025 | 0.1969826 | 0.8004909 | 0.1969826 |
| 0.80075 | 0.1997345 | 0.8009045 | 0.1997345 |
| 0.80100 | 0.2002613 | 0.8012155 | 0.2002613 |

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|---|---|---|---|
| 0.79775 | 0.1906311 | 0.7977856 | 0.1906311 |
| 0.80175 | 0.2051958 | 0.8019322 | 0.2051958 |
| 0.80025 | 0.2005886 | 0.8003682 | 0.2005886 |
| 0.79900 | 0.1961871 | 0.7990901 | 0.1961871 |
| 0.80250 | 0.2108069 | 0.8024131 | 0.2108069 |
| 0.79900 | 0.1942690 | 0.7991137 | 0.1942690 |
| 0.79775 | 0.1871791 | 0.7980050 | 0.1871791 |
| 0.80225 | 0.2067128 | 0.8023348 | 0.2067128 |
| 0.80075 | 0.2005186 | 0.8008751 | 0.2005186 |
| 0.80200 | 0.2029529 | 0.8022660 | 0.2029529 |
| 0.79675 | 0.1810979 | 0.7971266 | 0.1810979 |
| 0.79725 | 0.1808097 | 0.7977237 | 0.1808097 |
| 0.79875 | 0.1893763 | 0.7992008 | 0.1893763 |
| 0.79775 | 0.1855571 | 0.7981271 | 0.1855571 |
| 0.80175 | 0.2075770 | 0.8018167 | 0.2075770 |
| 0.80125 | 0.2034414 | 0.8013878 | 0.2034414 |
| 0.80100 | 0.2012047 | 0.8011544 | 0.2012047 |
| 0.80100 | 0.2014319 | 0.8011326 | 0.2014319 |
| 0.79875 | 0.1928395 | 0.7988803 | 0.1928395 |
| 0.80600 | 0.2227126 | 0.8061307 | 0.2227126 |
| 0.80275 | 0.2090600 | 0.8029217 | 0.2090600 |
| 0.80475 | 0.2212368 | 0.8047172 | 0.2212368 |
| 0.80450 | 0.2172714 | 0.8046354 | 0.2172714 |
| 0.80450 | 0.2170786 | 0.8046226 | 0.2170786 |
| 0.79725 | 0.1861474 | 0.7974389 | 0.1861474 |
| 0.79850 | 0.1898907 | 0.7987459 | 0.1898907 |
| 0.79925 | 0.1956148 | 0.7993683 | 0.1956148 |
| 0.80000 | 0.1989549 | 0.8001431 | 0.1989549 |
| 0.79925 | 0.1982180 | 0.7992774 | 0.1982180 |
| 0.80550 | 0.2234004 | 0.8054431 | 0.2234004 |
| 0.80425 | 0.2139375 | 0.8046276 | 0.2139375 |
| 0.80175 | 0.2053091 | 0.8020138 | 0.2053091 |
| 0.80150 | 0.2032155 | 0.8017566 | 0.2032155 |
| 0.80025 | 0.1983303 | 0.8004765 | 0.1983303 |
| 0.80400 | 0.2131310 | 0.8041875 | 0.2131310 |
| 0.79800 | 0.1861547 | 0.7984222 | 0.1861547 |
| 0.79850 | 0.1903499 | 0.7987513 | 0.1903499 |
| 0.79700 | 0.1853013 | 0.7971338 | 0.1853013 |
| 0.79850 | 0.1926161 | 0.7986293 | 0.1926161 |
| 0.80200 | 0.2110931 | 0.8018296 | 0.2110931 |
| 0.80025 | 0.2034917 | 0.8001255 | 0.2034917 |
| 0.79775 | 0.1917295 | 0.7976662 | 0.1917295 |
| 0.79825 | 0.1944307 | 0.7981966 | 0.1944307 |
| 0.79725 | 0.1875066 | 0.7972830 | 0.1875066 |
| 0.79975 | 0.2006782 | 0.7996689 | 0.2006782 |
| 0.80025 | 0.1962190 | 0.8005601 | 0.1962190 |
| 0.79925 | 0.1948391 | 0.7994126 | 0.1948391 |
| 0.79800 | 0.1890228 | 0.7981646 | 0.1890228 |
| 0.79725 | 0.1888184 | 0.7972295 | 0.1888184 |
| 0.80125 | 0.2049213 | 0.8012647 | 0.2049213 |
| 0.80250 | 0.2075838 | 0.8026347 | 0.2075838 |
| 0.80050 | 0.1998816 | 0.8006604 | 0.1998816 |
| 0.80100 | 0.2040305 | 0.8010681 | 0.2040305 |
| 0.80125 | 0.2066349 | 0.8012108 | 0.2066349 |
| 0.80325 | 0.2076287 | 0.8035982 | 0.2076287 |

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|---|---|---|---|
| 0.80325 | 0.2125647 | 0.8033501 | 0.2125647 |
| 0.80175 | 0.2048130 | 0.8018306 | 0.2048130 |
| 0.80175 | 0.2070324 | 0.8018386 | 0.2070324 |
| 0.80200 | 0.2074726 | 0.8020668 | 0.2074726 |
| 0.80400 | 0.2106876 | 0.8046267 | 0.2106876 |
| 0.79925 | 0.1946348 | 0.7994467 | 0.1946348 |
| 0.79825 | 0.1861282 | 0.7986967 | 0.1861282 |
| 0.79675 | 0.1797886 | 0.7971305 | 0.1797886 |
| 0.79700 | 0.1825422 | 0.7973730 | 0.1825422 |
| 0.80475 | 0.2179404 | 0.8049524 | 0.2179404 |
| 0.80175 | 0.2073670 | 0.8017849 | 0.2073670 |
| 0.80300 | 0.2106544 | 0.8031256 | 0.2106544 |
| 0.80200 | 0.2090975 | 0.8019858 | 0.2090975 |
| 0.80175 | 0.2077645 | 0.8016994 | 0.2077645 |
| 0.80375 | 0.2126954 | 0.8037940 | 0.2126954 |
| 0.80425 | 0.2150751 | 0.8043694 | 0.2150751 |
| 0.80450 | 0.2199560 | 0.8042893 | 0.2199560 |
| 0.80500 | 0.2235626 | 0.8047246 | 0.2235626 |
| 0.80450 | 0.2211307 | 0.8042498 | 0.2211307 |
| 0.80300 | 0.2090913 | 0.8031552 | 0.2090913 |
| 0.80125 | 0.2064991 | 0.8011145 | 0.2064991 |
| 0.79925 | 0.2013708 | 0.7989771 | 0.2013708 |
| 0.79975 | 0.2019737 | 0.7995112 | 0.2019737 |
| 0.80100 | 0.2083279 | 0.8006931 | 0.2083279 |
| 0.80250 | 0.2089059 | 0.8025416 | 0.2089059 |
| 0.80150 | 0.2030607 | 0.8017320 | 0.2030607 |
| 0.79975 | 0.1944015 | 0.8000057 | 0.1944015 |
| 0.79975 | 0.1937536 | 0.8001011 | 0.1937536 |
| 0.79950 | 0.1938267 | 0.7997679 | 0.1938267 |
| 0.79825 | 0.1870730 | 0.7986547 | 0.1870730 |
| 0.80125 | 0.2002003 | 0.8015673 | 0.2002003 |
| 0.80025 | 0.1992661 | 0.8004046 | 0.1992661 |
| 0.80000 | 0.1969368 | 0.8002321 | 0.1969368 |
| 0.79875 | 0.1921970 | 0.7989784 | 0.1921970 |
| 0.79725 | 0.1852887 | 0.7973483 | 0.1852887 |
| 0.79475 | 0.1736462 | 0.7950844 | 0.1736462 |
| 0.79575 | 0.1809618 | 0.7959439 | 0.1809618 |
| 0.79625 | 0.1842140 | 0.7963011 | 0.1842140 |
| 0.79775 | 0.1909880 | 0.7978489 | 0.1909880 |
| 0.80400 | 0.2146217 | 0.8041080 | 0.2146217 |
| 0.80275 | 0.2093104 | 0.8029608 | 0.2093104 |
| 0.80175 | 0.2059094 | 0.8019379 | 0.2059094 |
| 0.80200 | 0.2079617 | 0.8020757 | 0.2079617 |
| 0.80100 | 0.2025256 | 0.8011323 | 0.2025256 |
| 0.80500 | 0.2220155 | 0.8049103 | 0.2220155 |
| 0.80075 | 0.2032174 | 0.8007491 | 0.2032174 |
| 0.80100 | 0.2005513 | 0.8012023 | 0.2005513 |
| 0.80075 | 0.2006688 | 0.8009013 | 0.2006688 |
| 0.80125 | 0.2006254 | 0.8015053 | 0.2006254 |
| 0.79825 | 0.1921766 | 0.7982565 | 0.1921766 |
| 0.80050 | 0.2015947 | 0.8006207 | 0.2015947 |
| 0.79925 | 0.1983312 | 0.7993189 | 0.1983312 |
| 0.79825 | 0.1942053 | 0.7982732 | 0.1942053 |
| 0.79925 | 0.1983458 | 0.7992333 | 0.1983458 |
| 0.80475 | 0.2170939 | 0.8048562 | 0.2170939 |

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|---|---|---|---|
| 0.80175 | 0.2059614 | 0.8020013 | 0.2059614 |
| 0.80325 | 0.2142148 | 0.8034165 | 0.2142148 |
| 0.80225 | 0.2121441 | 0.8023410 | 0.2121441 |
| 0.80150 | 0.2099171 | 0.8015537 | 0.2099171 |

| Mean_Recall | Mean_Detection_Rate | Mean_Balanced_Accuracy |
|---|---|---|
| 0.247 | 0.0494 | 0.529375 |
| 0.233 | 0.0466 | 0.520625 |
| 0.228 | 0.0456 | 0.517500 |
| 0.225 | 0.0450 | 0.515625 |
| 0.231 | 0.0462 | 0.519375 |
| 0.255 | 0.0510 | 0.534375 |
| 0.246 | 0.0492 | 0.528750 |
| 0.227 | 0.0454 | 0.516875 |
| 0.210 | 0.0420 | 0.506250 |
| 0.203 | 0.0406 | 0.501875 |
| 0.272 | 0.0544 | 0.545000 |
| 0.242 | 0.0484 | 0.526250 |
| 0.222 | 0.0444 | 0.513750 |
| 0.212 | 0.0424 | 0.507500 |
| 0.204 | 0.0408 | 0.502500 |
| 0.257 | 0.0514 | 0.535625 |
| 0.240 | 0.0480 | 0.525000 |
| 0.230 | 0.0460 | 0.518750 |
| 0.212 | 0.0424 | 0.507500 |
| 0.204 | 0.0408 | 0.502500 |
| 0.272 | 0.0544 | 0.545000 |
| 0.247 | 0.0494 | 0.529375 |
| 0.241 | 0.0482 | 0.525625 |
| 0.226 | 0.0452 | 0.516250 |
| 0.227 | 0.0454 | 0.516875 |
| 0.248 | 0.0496 | 0.530000 |
| 0.232 | 0.0464 | 0.520000 |
| 0.223 | 0.0446 | 0.514375 |
| 0.211 | 0.0422 | 0.506875 |
| 0.225 | 0.0450 | 0.515625 |
| 0.254 | 0.0508 | 0.533750 |
| 0.244 | 0.0488 | 0.527500 |
| 0.223 | 0.0446 | 0.514375 |
| 0.218 | 0.0436 | 0.511250 |
| 0.219 | 0.0438 | 0.511875 |
| 0.263 | 0.0526 | 0.539375 |
| 0.234 | 0.0468 | 0.521250 |
| 0.226 | 0.0452 | 0.516250 |
| 0.223 | 0.0446 | 0.514375 |
| 0.217 | 0.0434 | 0.510625 |
| 0.261 | 0.0522 | 0.538125 |
| 0.237 | 0.0474 | 0.523125 |
| 0.228 | 0.0456 | 0.517500 |
| 0.205 | 0.0410 | 0.503125 |
| 0.211 | 0.0422 | 0.506875 |
| 0.270 | 0.0540 | 0.543750 |
| 0.247 | 0.0494 | 0.529375 |
| 0.236 | 0.0472 | 0.522500 |
| 0.228 | 0.0456 | 0.517500 |
| 0.218 | 0.0436 | 0.511250 |

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|---|---|---|
| 0.211 | 0.0422 | 0.506875 |
| 0.210 | 0.0420 | 0.506250 |
| 0.212 | 0.0424 | 0.507500 |
| 0.205 | 0.0410 | 0.503125 |
| 0.209 | 0.0418 | 0.505625 |
| 0.234 | 0.0468 | 0.521250 |
| 0.225 | 0.0450 | 0.515625 |
| 0.225 | 0.0450 | 0.515625 |
| 0.214 | 0.0428 | 0.508750 |
| 0.210 | 0.0420 | 0.506250 |
| 0.227 | 0.0454 | 0.516875 |
| 0.196 | 0.0392 | 0.497500 |
| 0.191 | 0.0382 | 0.494375 |
| 0.188 | 0.0376 | 0.492500 |
| 0.189 | 0.0378 | 0.493125 |
| 0.217 | 0.0434 | 0.510625 |
| 0.205 | 0.0410 | 0.503125 |
| 0.210 | 0.0420 | 0.506250 |
| 0.195 | 0.0390 | 0.496875 |
| 0.204 | 0.0408 | 0.502500 |
| 0.229 | 0.0458 | 0.518125 |
| 0.201 | 0.0402 | 0.500625 |
| 0.194 | 0.0388 | 0.496250 |
| 0.208 | 0.0416 | 0.505000 |
| 0.203 | 0.0406 | 0.501875 |
| 0.238 | 0.0476 | 0.523750 |
| 0.242 | 0.0484 | 0.526250 |
| 0.221 | 0.0442 | 0.513125 |
| 0.210 | 0.0420 | 0.506250 |
| 0.211 | 0.0422 | 0.506875 |
| 0.216 | 0.0432 | 0.510000 |
| 0.204 | 0.0408 | 0.502500 |
| 0.209 | 0.0418 | 0.505625 |
| 0.209 | 0.0418 | 0.505625 |
| 0.209 | 0.0418 | 0.505625 |
| 0.202 | 0.0404 | 0.501250 |
| 0.203 | 0.0406 | 0.501875 |
| 0.193 | 0.0386 | 0.495625 |
| 0.204 | 0.0408 | 0.502500 |
| 0.189 | 0.0378 | 0.493125 |
| 0.227 | 0.0454 | 0.516875 |
| 0.201 | 0.0402 | 0.500625 |
| 0.195 | 0.0390 | 0.496875 |
| 0.196 | 0.0392 | 0.497500 |
| 0.191 | 0.0382 | 0.494375 |
| 0.218 | 0.0436 | 0.511250 |
| 0.202 | 0.0404 | 0.501250 |
| 0.196 | 0.0392 | 0.497500 |
| 0.195 | 0.0390 | 0.496875 |
| 0.191 | 0.0382 | 0.494375 |
| 0.218 | 0.0436 | 0.511250 |
| 0.223 | 0.0446 | 0.514375 |
| 0.222 | 0.0444 | 0.513750 |
| 0.211 | 0.0422 | 0.506875 |
| 0.219 | 0.0438 | 0.511875 |

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|---|---|---|
| 0.227 | 0.0454 | 0.516875 |
| 0.217 | 0.0434 | 0.510625 |
| 0.224 | 0.0448 | 0.515000 |
| 0.225 | 0.0450 | 0.515625 |
| 0.213 | 0.0426 | 0.508125 |
| 0.218 | 0.0436 | 0.511250 |
| 0.222 | 0.0444 | 0.513750 |
| 0.210 | 0.0420 | 0.506250 |
| 0.213 | 0.0426 | 0.508125 |
| 0.211 | 0.0422 | 0.506875 |
| 0.209 | 0.0418 | 0.505625 |
| 0.220 | 0.0440 | 0.512500 |
| 0.216 | 0.0432 | 0.510000 |
| 0.203 | 0.0406 | 0.501875 |
| 0.200 | 0.0400 | 0.500000 |
| 0.216 | 0.0432 | 0.510000 |
| 0.212 | 0.0424 | 0.507500 |
| 0.205 | 0.0410 | 0.503125 |
| 0.201 | 0.0402 | 0.500625 |
| 0.204 | 0.0408 | 0.502500 |
| 0.232 | 0.0464 | 0.520000 |
| 0.209 | 0.0418 | 0.505625 |
| 0.230 | 0.0460 | 0.518750 |
| 0.210 | 0.0420 | 0.506250 |
| 0.201 | 0.0402 | 0.500625 |
| 0.208 | 0.0416 | 0.505000 |
| 0.211 | 0.0422 | 0.506875 |
| 0.211 | 0.0422 | 0.506875 |
| 0.203 | 0.0406 | 0.501875 |
| 0.194 | 0.0388 | 0.496250 |
| 0.204 | 0.0408 | 0.502500 |
| 0.211 | 0.0422 | 0.506875 |
| 0.192 | 0.0384 | 0.495000 |
| 0.201 | 0.0402 | 0.500625 |
| 0.201 | 0.0402 | 0.500625 |
| 0.226 | 0.0452 | 0.516250 |
| 0.214 | 0.0428 | 0.508750 |
| 0.212 | 0.0424 | 0.507500 |
| 0.212 | 0.0424 | 0.507500 |
| 0.213 | 0.0426 | 0.508125 |
| 0.217 | 0.0434 | 0.510625 |
| 0.197 | 0.0394 | 0.498125 |
| 0.206 | 0.0412 | 0.503750 |
| 0.198 | 0.0396 | 0.498750 |
| 0.196 | 0.0392 | 0.497500 |
| 0.225 | 0.0450 | 0.515625 |
| 0.215 | 0.0430 | 0.509375 |
| 0.205 | 0.0410 | 0.503125 |
| 0.215 | 0.0430 | 0.509375 |
| 0.210 | 0.0420 | 0.506250 |
| 0.205 | 0.0410 | 0.503125 |
| 0.211 | 0.0422 | 0.506875 |
| 0.212 | 0.0424 | 0.507500 |
| 0.206 | 0.0412 | 0.503750 |
| 0.205 | 0.0410 | 0.503125 |

| | | |
|---|---|---|
| 0.209 | 0.0418 | 0.505625 |
| 0.207 | 0.0414 | 0.504375 |
| 0.200 | 0.0400 | 0.500000 |
| 0.206 | 0.0412 | 0.503750 |
| 0.206 | 0.0412 | 0.503750 |
| 0.210 | 0.0420 | 0.506250 |
| 0.188 | 0.0376 | 0.492500 |
| 0.190 | 0.0380 | 0.493750 |
| 0.189 | 0.0378 | 0.493125 |
| 0.193 | 0.0386 | 0.495625 |
| 0.226 | 0.0452 | 0.516250 |
| 0.188 | 0.0376 | 0.492500 |
| 0.193 | 0.0386 | 0.495625 |
| 0.190 | 0.0380 | 0.493750 |
| 0.192 | 0.0384 | 0.495000 |
| 0.215 | 0.0430 | 0.509375 |
| 0.214 | 0.0428 | 0.508750 |
| 0.213 | 0.0426 | 0.508125 |
| 0.217 | 0.0434 | 0.510625 |
| 0.209 | 0.0418 | 0.505625 |
| 0.202 | 0.0404 | 0.501250 |
| 0.202 | 0.0404 | 0.501250 |
| 0.197 | 0.0394 | 0.498125 |
| 0.199 | 0.0398 | 0.499375 |
| 0.196 | 0.0392 | 0.497500 |
| 0.214 | 0.0428 | 0.508750 |
| 0.215 | 0.0430 | 0.509375 |
| 0.207 | 0.0414 | 0.504375 |
| 0.206 | 0.0412 | 0.503750 |
| 0.193 | 0.0386 | 0.495625 |
| 0.207 | 0.0414 | 0.504375 |
| 0.202 | 0.0404 | 0.501250 |
| 0.202 | 0.0404 | 0.501250 |
| 0.203 | 0.0406 | 0.501875 |
| 0.203 | 0.0406 | 0.501875 |
| 0.213 | 0.0426 | 0.508125 |
| 0.198 | 0.0396 | 0.498750 |
| 0.195 | 0.0390 | 0.496875 |
| 0.184 | 0.0368 | 0.490000 |
| 0.182 | 0.0364 | 0.488750 |
| 0.194 | 0.0388 | 0.496250 |
| 0.202 | 0.0404 | 0.501250 |
| 0.212 | 0.0424 | 0.507500 |
| 0.212 | 0.0424 | 0.507500 |
| 0.213 | 0.0426 | 0.508125 |
| 0.210 | 0.0420 | 0.506250 |
| 0.209 | 0.0418 | 0.505625 |
| 0.200 | 0.0400 | 0.500000 |
| 0.200 | 0.0400 | 0.500000 |
| 0.210 | 0.0420 | 0.506250 |
| 0.212 | 0.0424 | 0.507500 |
| 0.185 | 0.0370 | 0.490625 |
| 0.185 | 0.0370 | 0.490625 |
| 0.193 | 0.0386 | 0.495625 |
| 0.192 | 0.0384 | 0.495000 |

| | | |
|---|---|---|
| 0.200 | 0.0400 | 0.500000 |
| 0.201 | 0.0402 | 0.500625 |
| 0.196 | 0.0392 | 0.497500 |
| 0.190 | 0.0380 | 0.493750 |
| 0.200 | 0.0400 | 0.500000 |
| 0.202 | 0.0404 | 0.501250 |
| 0.195 | 0.0390 | 0.496875 |
| 0.200 | 0.0400 | 0.500000 |
| 0.188 | 0.0376 | 0.492500 |
| 0.196 | 0.0392 | 0.497500 |
| 0.233 | 0.0466 | 0.520625 |
| 0.224 | 0.0448 | 0.515000 |
| 0.224 | 0.0448 | 0.515000 |
| 0.220 | 0.0440 | 0.512500 |
| 0.212 | 0.0424 | 0.507500 |
| 0.221 | 0.0442 | 0.513125 |
| 0.215 | 0.0430 | 0.509375 |
| 0.214 | 0.0428 | 0.508750 |
| 0.219 | 0.0438 | 0.511875 |
| 0.212 | 0.0424 | 0.507500 |
| 0.217 | 0.0434 | 0.510625 |
| 0.202 | 0.0404 | 0.501250 |
| 0.196 | 0.0392 | 0.497500 |
| 0.201 | 0.0402 | 0.500625 |
| 0.200 | 0.0400 | 0.500000 |
| 0.202 | 0.0404 | 0.501250 |
| 0.212 | 0.0424 | 0.507500 |
| 0.202 | 0.0404 | 0.501250 |
| 0.206 | 0.0412 | 0.503750 |
| 0.205 | 0.0410 | 0.503125 |
| 0.206 | 0.0412 | 0.503750 |
| 0.199 | 0.0398 | 0.499375 |
| 0.195 | 0.0390 | 0.496875 |
| 0.198 | 0.0396 | 0.498750 |
| 0.191 | 0.0382 | 0.494375 |
| 0.244 | 0.0488 | 0.527500 |
| 0.227 | 0.0454 | 0.516875 |
| 0.218 | 0.0436 | 0.511250 |
| 0.223 | 0.0446 | 0.514375 |
| 0.211 | 0.0422 | 0.506875 |
| 0.249 | 0.0498 | 0.530625 |
| 0.238 | 0.0476 | 0.523750 |
| 0.220 | 0.0440 | 0.512500 |
| 0.200 | 0.0400 | 0.500000 |
| 0.203 | 0.0406 | 0.501875 |
| 0.251 | 0.0502 | 0.531875 |
| 0.234 | 0.0468 | 0.521250 |
| 0.213 | 0.0426 | 0.508125 |
| 0.205 | 0.0410 | 0.503125 |
| 0.207 | 0.0414 | 0.504375 |
| 0.254 | 0.0508 | 0.533750 |
| 0.227 | 0.0454 | 0.516875 |
| 0.219 | 0.0438 | 0.511875 |
| 0.216 | 0.0432 | 0.510000 |
| 0.202 | 0.0404 | 0.501250 |

| | | |
|---|---|---|
| 0.261 | 0.0522 | 0.538125 |
| 0.242 | 0.0484 | 0.526250 |
| 0.221 | 0.0442 | 0.513125 |
| 0.220 | 0.0440 | 0.512500 |
| 0.214 | 0.0428 | 0.508750 |
| 0.248 | 0.0496 | 0.530000 |
| 0.224 | 0.0448 | 0.515000 |
| 0.217 | 0.0434 | 0.510625 |
| 0.223 | 0.0446 | 0.514375 |
| 0.210 | 0.0420 | 0.506250 |
| 0.244 | 0.0488 | 0.527500 |
| 0.252 | 0.0504 | 0.532500 |
| 0.226 | 0.0452 | 0.516250 |
| 0.217 | 0.0434 | 0.510625 |
| 0.208 | 0.0416 | 0.505000 |
| 0.232 | 0.0464 | 0.520000 |
| 0.220 | 0.0440 | 0.512500 |
| 0.208 | 0.0416 | 0.505000 |
| 0.205 | 0.0410 | 0.503125 |
| 0.209 | 0.0418 | 0.505625 |
| 0.253 | 0.0506 | 0.533125 |
| 0.236 | 0.0472 | 0.522500 |
| 0.215 | 0.0430 | 0.509375 |
| 0.207 | 0.0414 | 0.504375 |
| 0.200 | 0.0400 | 0.500000 |
| 0.259 | 0.0518 | 0.536875 |
| 0.247 | 0.0494 | 0.529375 |
| 0.226 | 0.0452 | 0.516250 |
| 0.217 | 0.0434 | 0.510625 |
| 0.209 | 0.0418 | 0.505625 |
| 0.212 | 0.0424 | 0.507500 |
| 0.216 | 0.0432 | 0.510000 |
| 0.214 | 0.0428 | 0.508750 |
| 0.206 | 0.0412 | 0.503750 |
| 0.199 | 0.0398 | 0.499375 |
| 0.215 | 0.0430 | 0.509375 |
| 0.211 | 0.0422 | 0.506875 |
| 0.217 | 0.0434 | 0.510625 |
| 0.220 | 0.0440 | 0.512500 |
| 0.208 | 0.0416 | 0.505000 |
| 0.213 | 0.0426 | 0.508125 |
| 0.210 | 0.0420 | 0.506250 |
| 0.215 | 0.0430 | 0.509375 |
| 0.216 | 0.0432 | 0.510000 |
| 0.204 | 0.0408 | 0.502500 |
| 0.226 | 0.0452 | 0.516250 |
| 0.208 | 0.0416 | 0.505000 |
| 0.202 | 0.0404 | 0.501250 |
| 0.192 | 0.0384 | 0.495000 |
| 0.197 | 0.0394 | 0.498125 |
| 0.228 | 0.0456 | 0.517500 |
| 0.210 | 0.0420 | 0.506250 |
| 0.197 | 0.0394 | 0.498125 |
| 0.195 | 0.0390 | 0.496875 |
| 0.201 | 0.0402 | 0.500625 |

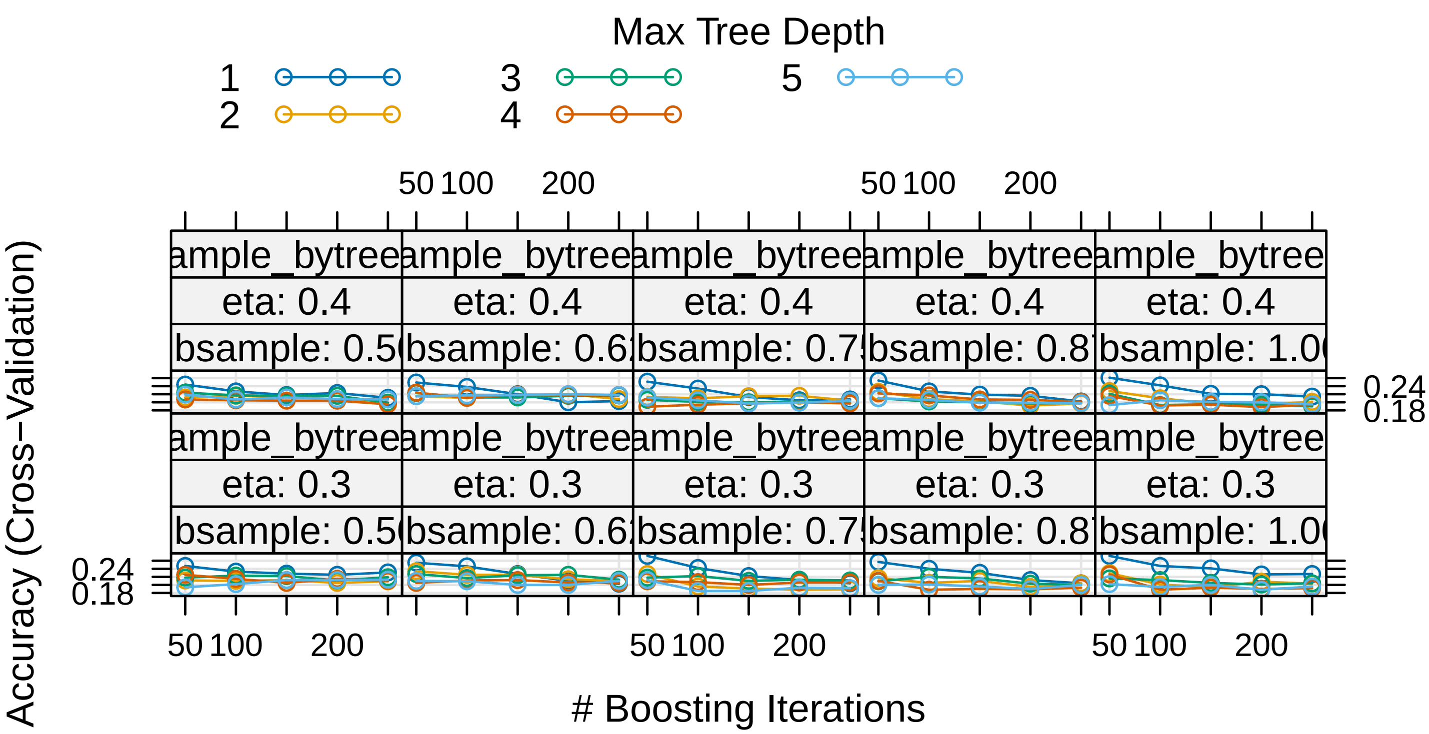
| | | |
|---|---|---|
| 0.212 | 0.0424 | 0.507500 |
| 0.244 | 0.0488 | 0.527500 |
| 0.224 | 0.0448 | 0.515000 |
| 0.209 | 0.0418 | 0.505625 |
| 0.218 | 0.0436 | 0.511250 |
| 0.239 | 0.0478 | 0.524375 |
| 0.215 | 0.0430 | 0.509375 |
| 0.201 | 0.0402 | 0.500625 |
| 0.198 | 0.0396 | 0.498750 |
| 0.198 | 0.0396 | 0.498750 |
| 0.203 | 0.0406 | 0.501875 |
| 0.199 | 0.0398 | 0.499375 |
| 0.193 | 0.0386 | 0.495625 |
| 0.192 | 0.0384 | 0.495000 |
| 0.184 | 0.0368 | 0.490000 |
| 0.221 | 0.0442 | 0.513125 |
| 0.202 | 0.0404 | 0.501250 |
| 0.212 | 0.0424 | 0.507500 |
| 0.209 | 0.0418 | 0.505625 |
| 0.205 | 0.0410 | 0.503125 |
| 0.219 | 0.0438 | 0.511875 |
| 0.224 | 0.0448 | 0.515000 |
| 0.206 | 0.0412 | 0.503750 |
| 0.207 | 0.0414 | 0.504375 |
| 0.202 | 0.0404 | 0.501250 |
| 0.224 | 0.0448 | 0.515000 |
| 0.217 | 0.0434 | 0.510625 |
| 0.216 | 0.0432 | 0.510000 |
| 0.216 | 0.0432 | 0.510000 |
| 0.199 | 0.0398 | 0.499375 |
| 0.223 | 0.0446 | 0.514375 |
| 0.212 | 0.0424 | 0.507500 |
| 0.212 | 0.0424 | 0.507500 |
| 0.216 | 0.0432 | 0.510000 |
| 0.217 | 0.0434 | 0.510625 |
| 0.206 | 0.0412 | 0.503750 |
| 0.201 | 0.0402 | 0.500625 |
| 0.200 | 0.0400 | 0.500000 |
| 0.202 | 0.0404 | 0.501250 |
| 0.198 | 0.0396 | 0.498750 |
| 0.210 | 0.0420 | 0.506250 |
| 0.202 | 0.0404 | 0.501250 |
| 0.200 | 0.0400 | 0.500000 |
| 0.197 | 0.0394 | 0.498125 |
| 0.199 | 0.0398 | 0.499375 |
| 0.221 | 0.0442 | 0.513125 |
| 0.193 | 0.0386 | 0.495625 |
| 0.195 | 0.0390 | 0.496875 |
| 0.194 | 0.0388 | 0.496250 |
| 0.190 | 0.0380 | 0.493750 |
| 0.225 | 0.0450 | 0.515625 |
| 0.204 | 0.0408 | 0.502500 |
| 0.221 | 0.0442 | 0.513125 |
| 0.207 | 0.0414 | 0.504375 |
| 0.210 | 0.0420 | 0.506250 |

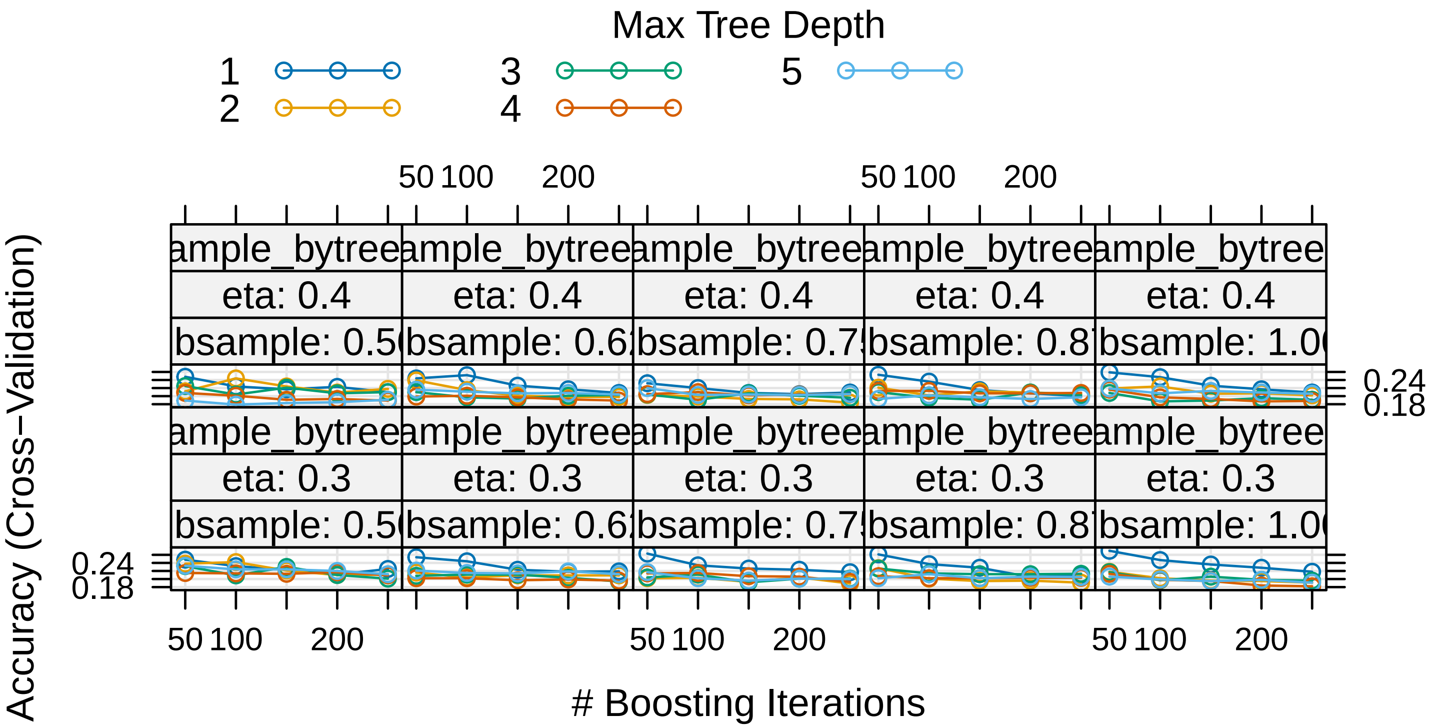
| | | |
|---|---|---|
| 0.210 | 0.0420 | 0.506250 |
| 0.197 | 0.0394 | 0.498125 |
| 0.194 | 0.0388 | 0.496250 |
| 0.201 | 0.0402 | 0.500625 |
| 0.203 | 0.0406 | 0.501875 |
| 0.204 | 0.0408 | 0.502500 |
| 0.191 | 0.0382 | 0.494375 |
| 0.207 | 0.0414 | 0.504375 |
| 0.201 | 0.0402 | 0.500625 |
| 0.196 | 0.0392 | 0.497500 |
| 0.210 | 0.0420 | 0.506250 |
| 0.196 | 0.0392 | 0.497500 |
| 0.191 | 0.0382 | 0.494375 |
| 0.209 | 0.0418 | 0.505625 |
| 0.203 | 0.0406 | 0.501875 |
| 0.208 | 0.0416 | 0.505000 |
| 0.187 | 0.0374 | 0.491875 |
| 0.189 | 0.0378 | 0.493125 |
| 0.195 | 0.0390 | 0.496875 |
| 0.191 | 0.0382 | 0.494375 |
| 0.207 | 0.0414 | 0.504375 |
| 0.205 | 0.0410 | 0.503125 |
| 0.204 | 0.0408 | 0.502500 |
| 0.204 | 0.0408 | 0.502500 |
| 0.195 | 0.0390 | 0.496875 |
| 0.224 | 0.0448 | 0.515000 |
| 0.211 | 0.0422 | 0.506875 |
| 0.219 | 0.0438 | 0.511875 |
| 0.218 | 0.0436 | 0.511250 |
| 0.218 | 0.0436 | 0.511250 |
| 0.189 | 0.0378 | 0.493125 |
| 0.194 | 0.0388 | 0.496250 |
| 0.197 | 0.0394 | 0.498125 |
| 0.200 | 0.0400 | 0.500000 |
| 0.197 | 0.0394 | 0.498125 |
| 0.222 | 0.0444 | 0.513750 |
| 0.217 | 0.0434 | 0.510625 |
| 0.207 | 0.0414 | 0.504375 |
| 0.206 | 0.0412 | 0.503750 |
| 0.201 | 0.0402 | 0.500625 |
| 0.216 | 0.0432 | 0.510000 |
| 0.192 | 0.0384 | 0.495000 |
| 0.194 | 0.0388 | 0.496250 |
| 0.188 | 0.0376 | 0.492500 |
| 0.194 | 0.0388 | 0.496250 |
| 0.208 | 0.0416 | 0.505000 |
| 0.201 | 0.0402 | 0.500625 |
| 0.191 | 0.0382 | 0.494375 |
| 0.193 | 0.0386 | 0.495625 |
| 0.189 | 0.0378 | 0.493125 |
| 0.199 | 0.0398 | 0.499375 |
| 0.201 | 0.0402 | 0.500625 |
| 0.197 | 0.0394 | 0.498125 |
| 0.192 | 0.0384 | 0.495000 |
| 0.189 | 0.0378 | 0.493125 |

| | | |
|---|---|---|
| 0.205 | 0.0410 | 0.503125 |
| 0.210 | 0.0420 | 0.506250 |
| 0.202 | 0.0404 | 0.501250 |
| 0.204 | 0.0408 | 0.502500 |
| 0.205 | 0.0410 | 0.503125 |
| 0.213 | 0.0426 | 0.508125 |
| 0.213 | 0.0426 | 0.508125 |
| 0.207 | 0.0414 | 0.504375 |
| 0.207 | 0.0414 | 0.504375 |
| 0.208 | 0.0416 | 0.505000 |
| 0.216 | 0.0432 | 0.510000 |
| 0.197 | 0.0394 | 0.498125 |
| 0.193 | 0.0386 | 0.495625 |
| 0.187 | 0.0374 | 0.491875 |
| 0.188 | 0.0376 | 0.492500 |
| 0.219 | 0.0438 | 0.511875 |
| 0.207 | 0.0414 | 0.504375 |
| 0.212 | 0.0424 | 0.507500 |
| 0.208 | 0.0416 | 0.505000 |
| 0.207 | 0.0414 | 0.504375 |
| 0.215 | 0.0430 | 0.509375 |
| 0.217 | 0.0434 | 0.510625 |
| 0.218 | 0.0436 | 0.511250 |
| 0.220 | 0.0440 | 0.512500 |
| 0.218 | 0.0436 | 0.511250 |
| 0.212 | 0.0424 | 0.507500 |
| 0.205 | 0.0410 | 0.503125 |
| 0.197 | 0.0394 | 0.498125 |
| 0.199 | 0.0398 | 0.499375 |
| 0.204 | 0.0408 | 0.502500 |
| 0.210 | 0.0420 | 0.506250 |
| 0.206 | 0.0412 | 0.503750 |
| 0.199 | 0.0398 | 0.499375 |
| 0.199 | 0.0398 | 0.499375 |
| 0.198 | 0.0396 | 0.498750 |
| 0.193 | 0.0386 | 0.495625 |
| 0.205 | 0.0410 | 0.503125 |
| 0.201 | 0.0402 | 0.500625 |
| 0.200 | 0.0400 | 0.500000 |
| 0.195 | 0.0390 | 0.496875 |
| 0.189 | 0.0378 | 0.493125 |
| 0.179 | 0.0358 | 0.486875 |
| 0.183 | 0.0366 | 0.489375 |
| 0.185 | 0.0370 | 0.490625 |
| 0.191 | 0.0382 | 0.494375 |
| 0.216 | 0.0432 | 0.510000 |
| 0.211 | 0.0422 | 0.506875 |
| 0.207 | 0.0414 | 0.504375 |
| 0.208 | 0.0416 | 0.505000 |
| 0.204 | 0.0408 | 0.502500 |
| 0.220 | 0.0440 | 0.512500 |
| 0.203 | 0.0406 | 0.501875 |
| 0.204 | 0.0408 | 0.502500 |
| 0.203 | 0.0406 | 0.501875 |
| 0.205 | 0.0410 | 0.503125 |

```
  0.193        0.0386               0.495625
  0.202        0.0404               0.501250
  0.197        0.0394               0.498125
  0.193        0.0386               0.495625
  0.197        0.0394               0.498125
  0.219        0.0438               0.511875
  0.207        0.0414               0.504375
  0.213        0.0426               0.508125
  0.209        0.0418               0.505625
  0.206        0.0412               0.503750

Tuning parameter 'gamma' was held constant at a value of 0
Tuning
 parameter 'min_child_weight' was held constant at a value of 1
Accuracy was used to select the optimal model using the largest value.
The final values used for the model were nrounds = 50, max_depth = 1, eta
 = 0.3, gamma = 0, colsample_bytree = 0.6, min_child_weight = 1 and subsample
 = 0.75.
```

```r
plot(xgb_model)
```






```r
# predict on test set
xgb_preds <- predict(xgb_model, newdata = test_data)

# confusion matrix and accuracy
conf_matrix <- confusionMatrix(xgb_preds, test_data$Reason)
print(conf_matrix)
```

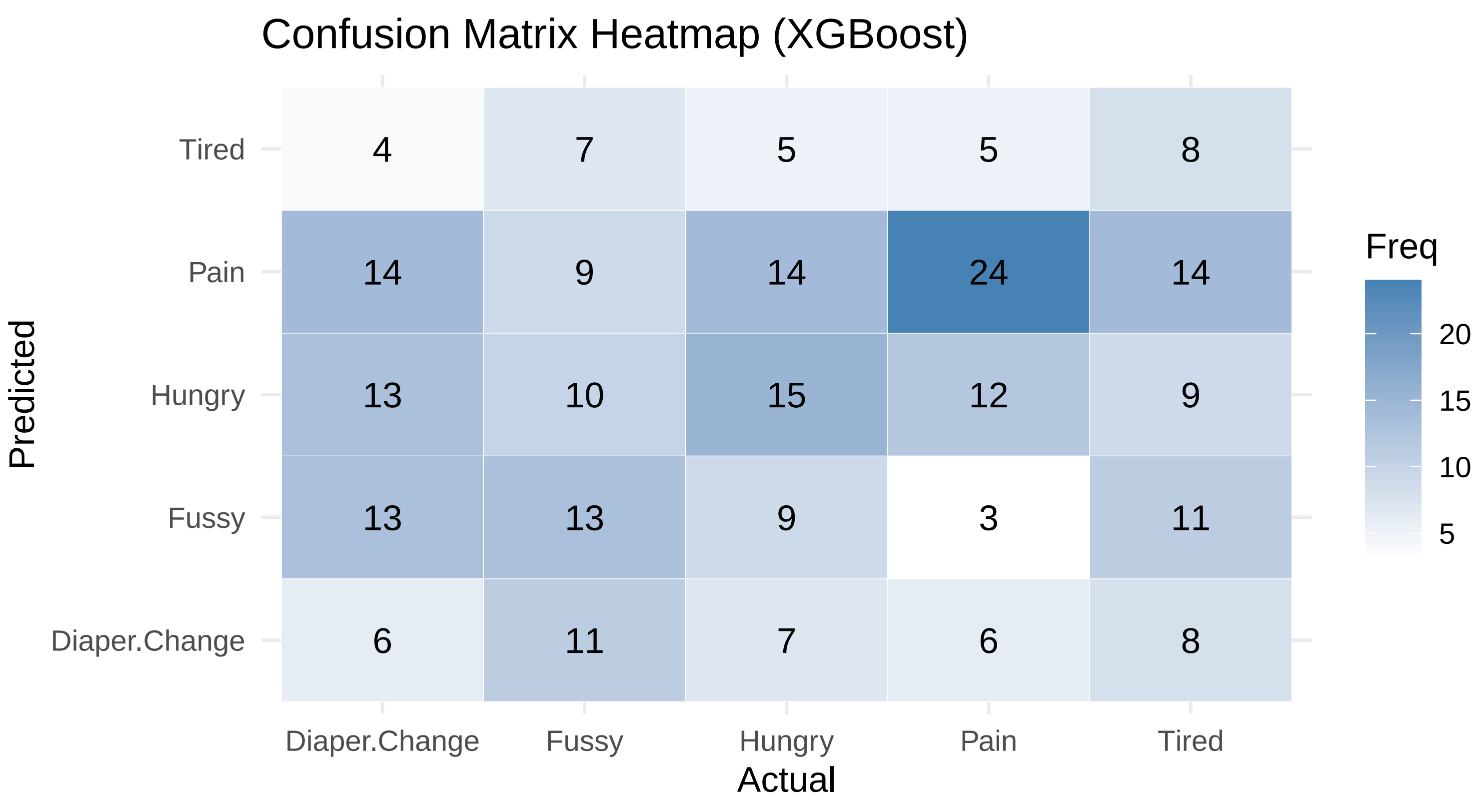
```
Confusion Matrix and Statistics

               Reference
Prediction      Diaper.Change Fussy Hungry Pain Tired
  Diaper.Change             6    11      7    6     8
  Fussy                    13    13      9    3    11
  Hungry                   13    10     15   12     9
  Pain                     14     9     14   24    14
  Tired                     4     7      5    5     8

Overall Statistics

               Accuracy : 0.264
                 95% CI : (0.2105, 0.3232)
    No Information Rate : 0.2
    P-Value [Acc > NIR] : 0.008598

                  Kappa : 0.08

 Mcnemar's Test P-Value : 0.099593

Statistics by Class:
```

```
                     Class: Diaper.Change Class: Fussy Class: Hungry
Sensitivity                        0.1200       0.2600        0.3000
Specificity                        0.8400       0.8200        0.7800
Pos Pred Value                     0.1579       0.2653        0.2542
Neg Pred Value                     0.7925       0.8159        0.8168
Prevalence                         0.2000       0.2000        0.2000
Detection Rate                     0.0240       0.0520        0.0600
Detection Prevalence               0.1520       0.1960        0.2360
Balanced Accuracy                  0.4800       0.5400        0.5400
                     Class: Pain Class: Tired
Sensitivity               0.4800       0.1600
Specificity               0.7450       0.8950
Pos Pred Value            0.3200       0.2759
Neg Pred Value            0.8514       0.8100
Prevalence                0.2000       0.2000
Detection Rate            0.0960       0.0320
Detection Prevalence      0.3000       0.1160
Balanced Accuracy         0.6125       0.5275
```

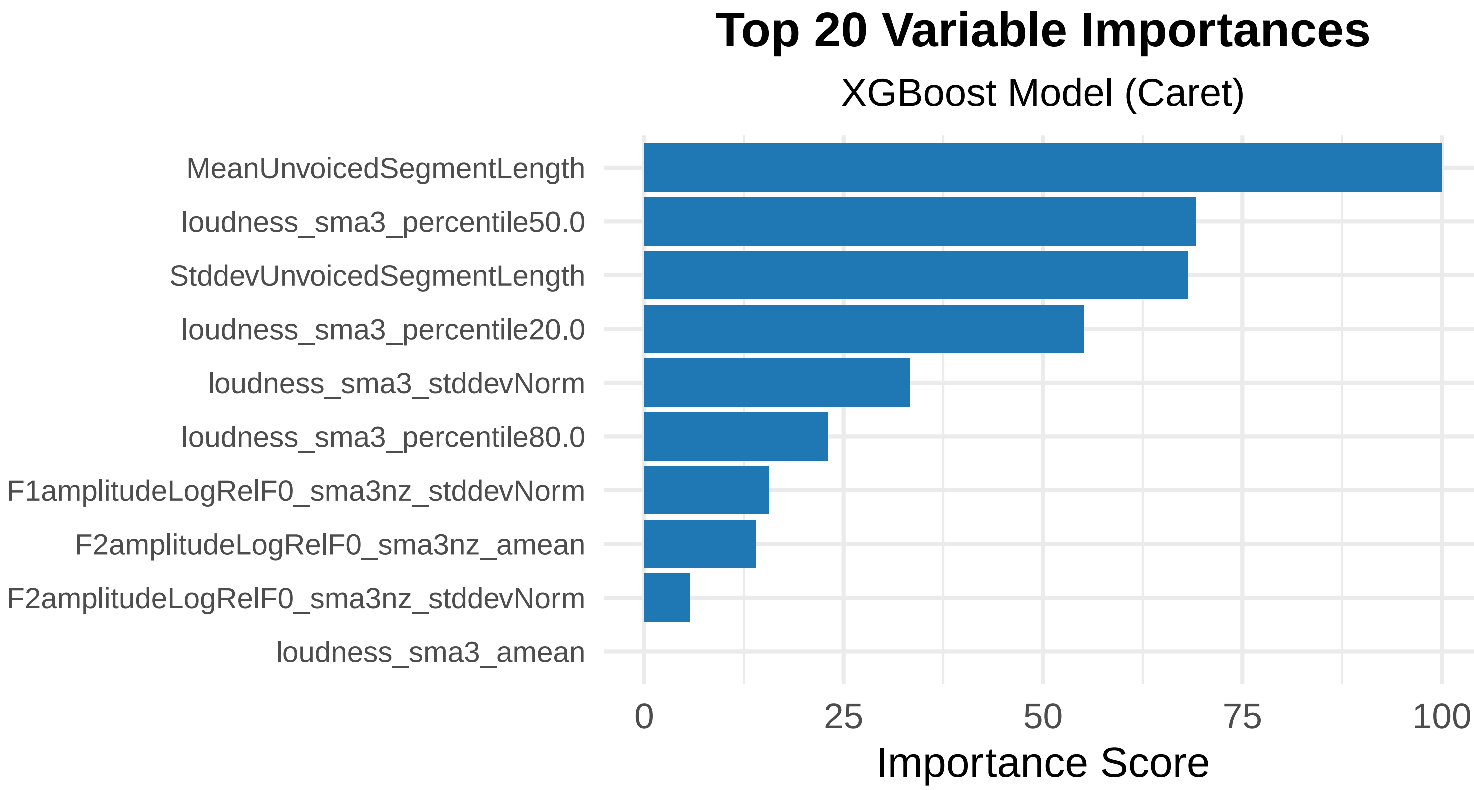
```r
accuracy <- conf_matrix$overall['Accuracy']
print(accuracy)
```

```
Accuracy
   0.264
```

```r
# creating a confusion matrix heatmap (pretty)
cm_df <- as.data.frame(conf_matrix$table)
ggplot(cm_df, aes(x = Reference, y = Prediction)) +
  geom_tile(aes(fill = Freq), color = "white") +
  geom_text(aes(label = Freq), size = 4) +
  scale_fill_gradient(low = "white", high = "steelblue") +
  theme_minimal() +
  labs(title = "Confusion Matrix Heatmap (XGBoost)", x = "Actual", y = "Predicted")
```




```r
# extract variable importance
xgb_imp <- varImp(xgb_model)$importance
xgb_imp$Variable <- rownames(xgb_imp)

# choose top 20 important features
top_n <- 20
xgb_imp <- as_tibble(xgb_imp) %>%
  arrange(desc(Overall)) %>%
  dplyr::slice(1:top_n)

# make a clean ggplot for variable importance
ggplot(xgb_imp, aes(x = reorder(Variable, Overall), y = Overall)) +
  geom_col(fill = "#1f78b4") +
  coord_flip() +
  theme_minimal(base_size = 13) +
  labs(title = "Top 20 Variable Importances",
       subtitle = "XGBoost Model (Caret)",
       x = NULL,
       y = "Importance Score") +
  theme(
    plot.title = element_text(hjust = 0.5, face = "bold", size = 15),
    plot.subtitle = element_text(hjust = 0.5, size = 12),
    axis.text.y = element_text(size = 9),
    axis.text.x = element_text(size = 11)
  )
```


Top 20 Variable Importances
XGBoost Model (Caret)
MeanUnvoicedSegmentLength
loudness_sma3_percentile50.0
StddevUnvoicedSegmentLength
loudness_sma3_percentile20.0
loudness_sma3_stddevNorm
loudness_sma3_percentile80.0
F1amplitudeLogRelF0_sma3nz_stddevNorm
F2amplitudeLogRelF0_sma3nz_amean
F2amplitudeLogRelF0_sma3nz_stddevNorm
loudness_sma3_amean
0
25
50
75
100
Importance Score