

Predicting Childhood Mortality Based on Health and Socio-Economic Indicators

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```
#Loading Libraries
library(tidyverse)

## — Attaching packages — tidyverse
1.3.2 —
## ✓ ggplot2 3.4.1    ✓ purrr  1.0.1
## ✓ tibble  3.2.1    ✓ dplyr  1.1.0
## ✓ tidyr   1.3.0    ✓ stringr 1.5.0
## ✓ readr   2.1.3    ✓ forcats 1.0.0

## Warning: package 'tibble' was built under R version 4.2.3

## — Conflicts —
tidyverse_conflicts() —
## ✗ dplyr::filter() masks stats::filter()
## ✗ dplyr::lag()    masks stats::lag()

library(dplyr)
library(readr)
library(caret)

## Warning: package 'caret' was built under R version 4.2.3

## Loading required package: lattice
##
## Attaching package: 'caret'
##
## The following object is masked from 'package:purrr':
##
##   lift

library(RANN)

## Warning: package 'RANN' was built under R version 4.2.3

library(skimr)

## Warning: package 'skimr' was built under R version 4.2.3

library(ggplot2)
library(stringr)
library(gbm)
```

```

## Warning: package 'gbm' was built under R version 4.2.3

## Loaded gbm 2.1.8.1

#loading the data set
mortality_rate <- read.csv('data/Mortality rate, under-5 (per 1,000 live
births).csv')
health_expenditure <- read.csv('data/Current health expenditure per capita
(current US$).csv')
health_expenditure_per <- read.csv('data/Current health expenditure (% of
GDP).csv')
education_expenditure <- read.csv('data/Current education expenditure, total
(%).csv')
literacy_rate <- read.csv('data/literacy_rate.csv')
domestic_health_expenditure <- read.csv('data/Domestic private health
expenditure (% of current health expenditure).csv')
economic_inequality <- read.csv('data/economic-inequality-gini-index.csv')
water_invest <- read.csv('data/Investment in water and sanitation (current
US$).csv')
vaccination <- read.csv('data/vaccination-coverage-by-income-in.csv')
water_productivity <- read.csv('data/Water productivity_per cubic meter of
total freshwater withdrawal.csv')
healthcare_access <- read.csv('data/healthcare-access-and-quality-index.csv')

#selecting from year 2000 till 2020
mortality_rate <- select(mortality_rate, country, 'X2000':'X2020')
health_expenditure <- select(health_expenditure, country, 'X2000':'X2020')
health_expenditure_per <- select(health_expenditure_per, country,
'X2000':'X2020')
literacy_rate <- select(literacy_rate, country, 'X2000':'X2020')
education_expenditure <- select(education_expenditure, country,
'X2000':'X2020')
water_invest <- select(water_invest, country, 'X2000':'X2020')
water_productivity <- select(water_productivity, country, 'X2000':'X2020')
domestic_health_expenditure <- select(domestic_health_expenditure, country,
'X2000':'X2020')
economic_inequality <- filter(economic_inequality, year >= 2000)
vaccination <- filter(vaccination, year >= 2000)
healthcare_access <- filter(healthcare_access, year >= 2000)

#renaming columns
mortality_rate_years <- select (mortality_rate, 'X2000':'X2020')
names(mortality_rate_years) <- str_sub(names(mortality_rate_years),2)
mortality_rate <- select(mortality_rate, country)
mortality_rate <- bind_cols(mortality_rate,mortality_rate_years)

health_expenditure_years <- select (health_expenditure, 'X2000':'X2020')
names(health_expenditure_years) <- str_sub(names(health_expenditure_years),2)
health_expenditure <- select(health_expenditure, country)
health_expenditure <- bind_cols(health_expenditure, health_expenditure_years)

```

```

health_expenditure_per_years <- select (health_expenditure_per,
'X2000':'X2020')
names(health_expenditure_per_years) <-
str_sub(names(health_expenditure_per_years),2)
health_expenditure_per <- select(health_expenditure_per, country)
health_expenditure_per <- bind_cols(health_expenditure_per,
health_expenditure_per_years)

education_expenditure_years <- select (education_expenditure,
'X2000':'X2020')
names(education_expenditure_years) <-
str_sub(names(education_expenditure_years),2)
education_expenditure <- select(education_expenditure, country)
education_expenditure <- bind_cols(education_expenditure,
education_expenditure_years)

domestic_health_expenditure_years <- select (domestic_health_expenditure,
'X2000':'X2020')
names(domestic_health_expenditure_years) <-
str_sub(names(domestic_health_expenditure_years),2)
domestic_health_expenditure <- select(domestic_health_expenditure, country)
domestic_health_expenditure <- bind_cols(domestic_health_expenditure,
domestic_health_expenditure_years)

literacy_rate_years <- select (literacy_rate, 'X2000':'X2020')
names(literacy_rate_years) <- str_sub(names(literacy_rate_years),2)
literacy_rate <- select(literacy_rate, country)
literacy_rate <- bind_cols(literacy_rate, literacy_rate_years)

water_invest_years <- select (water_invest, 'X2000':'X2020')
names(water_invest_years) <- str_sub(names(water_invest_years),2)
water_invest <- select(water_invest, country)
water_invest <- bind_cols(water_invest, water_invest_years)

water_productivity_years <- select (water_productivity, 'X2000':'X2020')
names(water_productivity_years) <- str_sub(names(water_productivity_years),2)
water_productivity <- select(water_productivity, country)
water_productivity <- bind_cols(water_productivity, water_productivity_years)

#pivoting tables
mortality_rate1 <- pivot_longer(mortality_rate, cols="2000":"2020",
                                names_to = "year",
                                values_to = "mortality_rate")
health_expenditure1 <- pivot_longer(health_expenditure, cols="2000":"2020",
                                names_to = "year",
                                values_to = "health_expenditure")
health_expenditure_per1 <- pivot_longer(health_expenditure_per,
cols="2000":"2020",
                                names_to = "year",
                                values_to = "health_expenditure_per")

```

```

education_expenditure1 <- pivot_longer(education_expenditure,
cols="2000":"2020",
                                names_to = "year",
                                values_to = "education_expenditure")
domestic_health_expenditure1 <- pivot_longer(domestic_health_expenditure,
cols="2000":"2020",
                                names_to = "year",
                                values_to = "domestic_health_expenditure")
literacy_rate1 <- pivot_longer(literacy_rate, cols="2000":"2020",
                                names_to = "year",
                                values_to = "literacy_rate")
water_invest1 <- pivot_longer(water_invest, cols="2000":"2020",
                                names_to = "year",
                                values_to = "water_invest")
water_productivity1 <- pivot_longer(water_productivity, cols="2000":"2020",
                                names_to = "year",
                                values_to = "water_productivity")

#merging data
merge_data <- merge(mortality_rate1, health_expenditure1, by = c("country",
"year"), all = TRUE)
merge_data <- merge(merge_data, health_expenditure_per1, by = c("country",
"year"), all = TRUE)
merge_data <- merge(merge_data, education_expenditure1, by = c("country",
"year"), all = TRUE)
merge_data <- merge(merge_data, domestic_health_expenditure1, by =
c("country", "year"), all = TRUE)
merge_data <- merge(merge_data, literacy_rate1, by = c("country", "year"),
all = TRUE)
merge_data <- merge(merge_data, water_invest1, by = c("country", "year"), all
= TRUE)
merge_data <- merge(merge_data, water_productivity1, by = c("country",
"year"), all = TRUE)
merge_data <- merge(merge_data, vaccination, by = c("country", "year"), all =
TRUE)

glimpse(merge_data)

## Rows: 7,403
## Columns: 12
## $ country      <chr> "Abkhazia", "Afghanistan",
"Afghanistan", ...
## $ year         <chr> "2015", "2000", "2001", "2002",
"2003", "2...
## $ mortality_rate <dbl> NA, 129.3, 125.3, 121.2, 117.0, 112.8,
108...
## $ health_expenditure <dbl> NA, NA, NA, 17.00759, 17.81492,
21.42946, ...
## $ health_expenditure_per <dbl> NA, NA, NA, 9.443391, 8.941258,
9.808474, ...

```

```
## $ education_expenditure      <dbl> NA, NA, NA, NA, NA, NA, NA, NA, NA,
NA, NA...
## $ domestic_health_expenditure <dbl> NA, NA, NA, 85.37560, 86.06919,
84.52759, ...
## $ literacy_rate              <dbl> NA, NA, NA, NA, NA, NA, NA, NA, NA,
NA, NA...
## $ water_invest               <dbl> NA, NA, NA, NA, NA, NA, NA, NA, NA,
NA, NA...
## $ water_productivity         <dbl> NA, NA, NA, 0.3725069, 0.4054078,
0.411140...
## $ immunazation              <int> NA, 24, 33, 36, 41, 50, 58, 58, 63,
64, 63...
## $ GDP_per_capita            <dbl> NA, NA, NA, NA, NA, NA, NA, NA, NA,
NA, NA...

skimmed <- skim_to_wide(merge_data)

## Warning: 'skim_to_wide' is deprecated.
## Use 'skim()' instead.
## See help("Deprecated")

skimmed
```

Data summary

Name	Piped data
Number of rows	7403
Number of columns	12

Column type frequency:


character	2
numeric	10

Group variables	None
-----------------	------

Variable type: character

skim_variable	n_missing	complete_rate	min	max	empty	n_unique	whitespace
country	0	1	4	52	0	385	0
year	0	1	4	4	0	22	0

Variable type: numeric

skim_variable	n_missing	complete_rate	mean	sd	p0	p25	p50	p75	p100	hist
mortality_rate	227	0.69	40.90	4.085	1.8	9.80	2.420	6.252	2.285	

skim_variable	n_missing	complete_rate	mean	sd	p0	p25	p50	p75	p100	hist
e	9			000e+01	0		00e+01	000e+01	000e+02	__ _
health_expenditure	2477	0.67	876.37	1.567730e+03	4.45	62.73	2.40640e+02	7.461300e+02	1.170241e+04	█ __ _
health_expenditure_per	2477	0.67	6.14	2.740000e+00	1.26	4.24	5.40000e+00	7.720000e+00	2.423000e+01	██ __ _
education_expenditure	5669	0.23	90.86	7.220000e+00	32.81	88.92	9.22500e+01	9.509000e+01	1.000000e+02	__ __ █
domestic_health_expenditure	2477	0.67	42.30	1.852000e+01	0.52	28.05	4.22700e+01	5.585000e+01	8.794000e+01	███ █
literacy_rate	5742	0.22	80.21	1.719000e+01	14.38	66.54	8.54000e+01	9.450000e+01	1.000000e+02	__ ██
water_invest	7117	0.04	953377952.62	1.280216e+09	0.0	96250000.	3.67710e+08	1.338034e+09	6.272480e+09	█ __ _
water_productivity	2827	0.62	56.87	1.424400e+02	0.22	6.65	1.56500e+01	4.772000e+01	3.072790e+03	█ __ _
immunization	2978	0.60	86.79	1.470000e+01	19.00	82.00	9.30000e+01	9.700000e+01	9.900000e+01	__ _█ █
GDP_per_capita	3753	0.49	19489.65	2.203415e+04	251.09	4219.56	1.15329e+04	2.762972e+04	3.032066e+05	█ __ _

#including counties of the world

```
all_countries <- c("Afghanistan", "Albania", "Algeria", "Andorra", "Angola",
  "Antigua and Barbuda",
  "Argentina", "Armenia", "Australia", "Austria", "Azerbaijan", "Bahamas",
  "Bahrain",
  "Bangladesh", "Barbados", "Belarus", "Belgium", "Belize", "Benin",
  "Bhutan",
  "Bolivia", "Bosnia and Herzegovina", "Botswana", "Brazil", "Brunei",
  "Bulgaria",
  "Burkina Faso", "Burundi", "Cabo Verde", "Cambodia", "Cameroon",
  "Canada",
```

"Central African Republic", "Chad", "Chile", "China", "Colombia",
"Comoros",
"Congo", "Costa Rica", "Croatia", "Cuba", "Cyprus", "Czech Republic",
"Denmark",
"Djibouti", "Dominica", "Dominican Republic", "East Timor", "Ecuador",
"Egypt",
"El Salvador", "Equatorial Guinea", "Eritrea", "Estonia", "Eswatini",
"Ethiopia",
"Fiji", "Finland", "France", "Gabon", "Gambia", "Georgia", "Germany",
"Ghana",
"Greece", "Grenada", "Guatemala", "Guinea", "Guinea-Bissau", "Guyana",
"Haiti",
"Honduras", "Hungary", "Iceland", "India", "Indonesia", "Iran", "Iraq",
"Ireland",
"Israel", "Italy", "Jamaica", "Japan", "Jordan", "Kazakhstan", "Kenya",
"Kiribati",
"Korea, North", "Korea, South", "Kosovo", "Kuwait", "Kyrgyzstan", "Laos",
"Latvia",
"Lebanon", "Lesotho", "Liberia", "Libya", "Liechtenstein", "Lithuania",
"Luxembourg",
"Madagascar", "Malawi", "Malaysia", "Maldives", "Mali", "Malta",
"Marshall Islands",
"Mauritania", "Mauritius", "Mexico", "Micronesia", "Moldova", "Monaco",
"Mongolia",
"Montenegro", "Morocco", "Mozambique", "Myanmar", "Namibia", "Nauru",
"Nepal",
"Netherlands", "New Zealand", "Nicaragua", "Niger", "Nigeria", "North
Macedonia",
"Norway", "Oman", "Pakistan", "Palau", "Panama", "Papua New Guinea",
"Paraguay",
"Peru", "Philippines", "Poland", "Portugal", "Qatar", "Romania",
"Russia", "Rwanda",
"Saint Kitts and Nevis", "Saint Lucia", "Saint Vincent and the
Grenadines", "Samoa",
"San Marino", "Sao Tome and Principe", "Saudi Arabia", "Senegal",
"Serbia", "Seychelles",
"Sierra Leone", "Singapore", "Slovakia", "Slovenia", "Solomon Islands",
"Somalia",
"South Africa", "South Sudan", "Spain", "Sri Lanka", "Sudan", "Suriname",
"Sweden",
"Switzerland", "Syria", "Taiwan", "Tajikistan", "Tanzania", "Thailand",
"Togo",
"Tonga", "Trinidad and Tobago", "Tunisia", "Turkey", "Turkmenistan",
"Tuvalu",
"Uganda", "Ukraine", "United Arab Emirates", "United Kingdom", "United
States",
"Uruguay", "Uzbekistan", "Vanuatu", "Vatican City", "Venezuela",
"Vietnam",
"Yemen", "Zambia", "Zimbabwe")

```

merge_data <- subset(merge_data, country %in% all_countries)

#saving the final data
write.csv(merge_data, "data/my_data.csv")

#remove rows with all na
filtered_data <- merge_data %>%
  select(-country, -year) %>%
  filter(rowSums(is.na(.)) != ncol(.))

# Create the knn imputation model on the training data
preProcess_missingdata_model <- preProcess(filtered_data, method='knnImpute')
preProcess_missingdata_model

## Created from 39 samples and 10 variables
##
## Pre-processing:
##   - centered (10)
##   - ignored (0)
##   - 5 nearest neighbor imputation (10)
##   - scaled (10)

# Use the imputation model to predict the values of missing data points
my_data_imputed <- predict(preProcess_missingdata_model, newdata =
  filtered_data)
anyNA(my_data_imputed)

## [1] FALSE

#saving the imputed data
write.csv(my_data_imputed, "data/my_data_imputed.csv")

```

What is the trend and pattern of the average mortality rate over the years and are there any significant changes or fluctuations observed?

```

# Impute missing values in the mortality_rate column using mean
imputed_data_mean <- merge_data %>%
  mutate(mortality_rate = replace_na(mortality_rate, mean(mortality_rate,
na.rm = TRUE)))

write.csv(imputed_data_mean, "data/imputed_data_mean.csv")

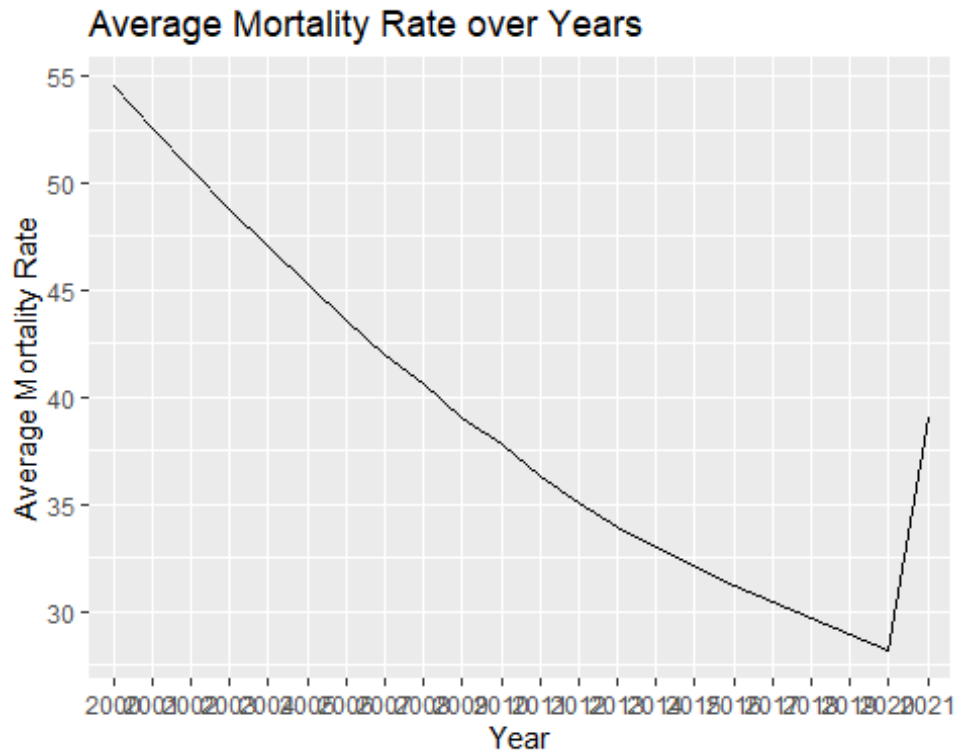
# Aggregate data by year and calculate the average mortality rate
avg_mortality <- aggregate(mortality_rate ~ year, data = imputed_data_mean,
FUN = mean)

# Create the line plot
ggplot(avg_mortality, aes(x = year, y = mortality_rate, group = 1)) +
  geom_line() +
  xlab("Year") +

```



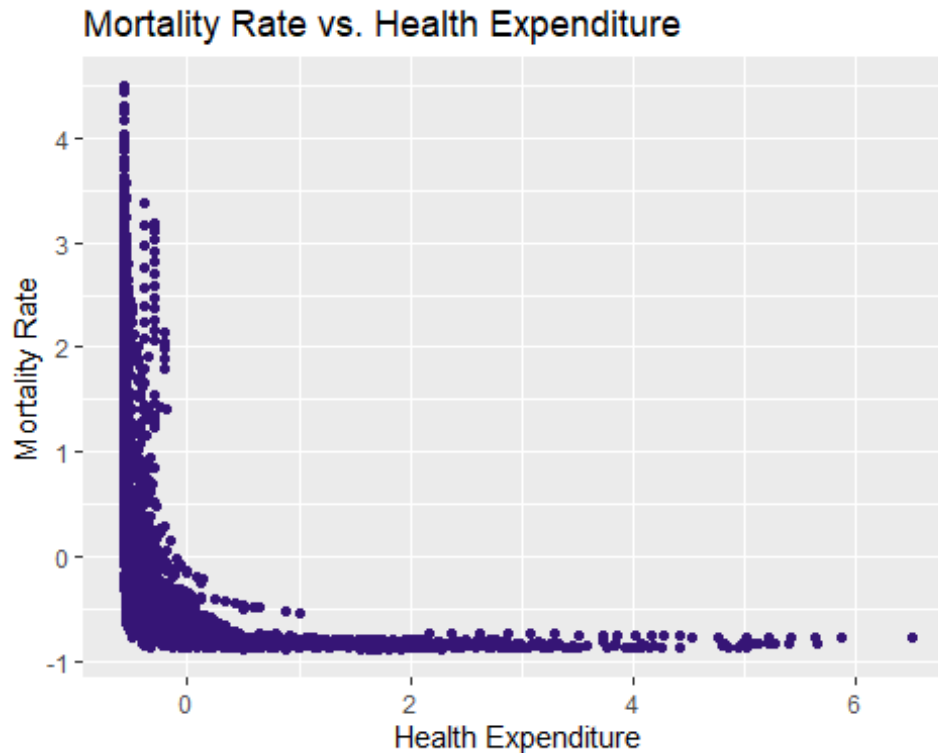
```
ylab("Average Mortality Rate") +
ggtitle("Average Mortality Rate over Years")
```



The plot depicts the average mortality rate over a range of years. The x-axis represents the years, while the y-axis represents the average mortality rate. The plot reveals a trend of the average mortality rate over time. In the earlier years, the average mortality rate was relatively high, gradually declining in subsequent years. However, there was a slight increase in the average mortality rate in 2018. Also, the plot shows a significant and noticeable increase in the average mortality rate in 2020. The sudden surge in the average mortality rate suggests a critical event or influential factor that impacted the population's health during this period.

What is the relationship between Mortality Rate and Health Expenditure?

```
ggplot(data=my_data_imputed,mapping= aes(x = health_expenditure, y =
mortality_rate)) +
  geom_point(color="#361576") +
  xlab("Health Expenditure") +
  ylab("Mortality Rate") +
  ggtitle("Mortality Rate vs. Health Expenditure")
```

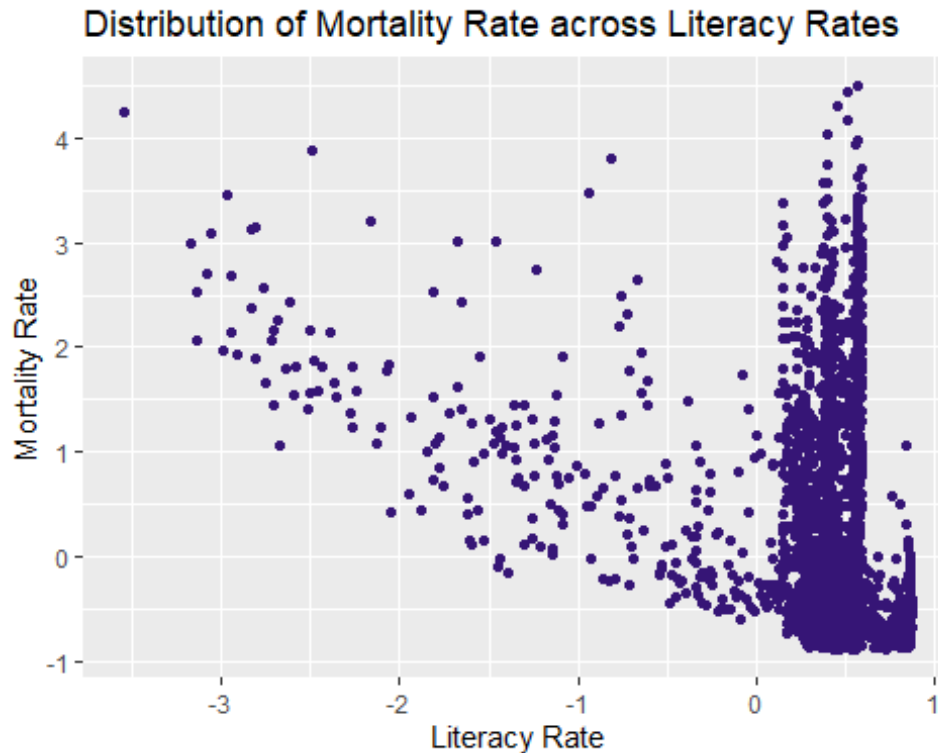


The plot showcases the relationship between Mortality Rate and Health Expenditure. The x-axis represents Health Expenditure, while the y-axis represents Mortality Rate. The plot demonstrates the varying levels of Mortality Rate observed at different levels of Health Expenditure.

Upon closer examination, it becomes apparent that there is an inverse relationship between Mortality Rate and Health Expenditure. As Health Expenditure increases, Mortality Rate tends to decrease, suggesting a potential link between higher healthcare investment and improved health outcomes. However, it is worth noting that this relationship may not be entirely linear, as there are instances where the Mortality Rate remains relatively high despite higher Health Expenditure.

How does Literacy Rate affects Mortality Rate?

```
ggplot(data = my_data_imputed, mapping=aes(x = literacy_rate, y = mortality_rate)) +
  geom_point(color="#361576") +
  xlab("Literacy Rate") +
  ylab("Mortality Rate") +
  ggtitle("Distribution of Mortality Rate across Literacy Rates")
```



The plot illustrates the distribution of Mortality Rate across different levels of Literacy Rates. The x-axis represents the Literacy Rates, while the y-axis represents the Mortality Rate.

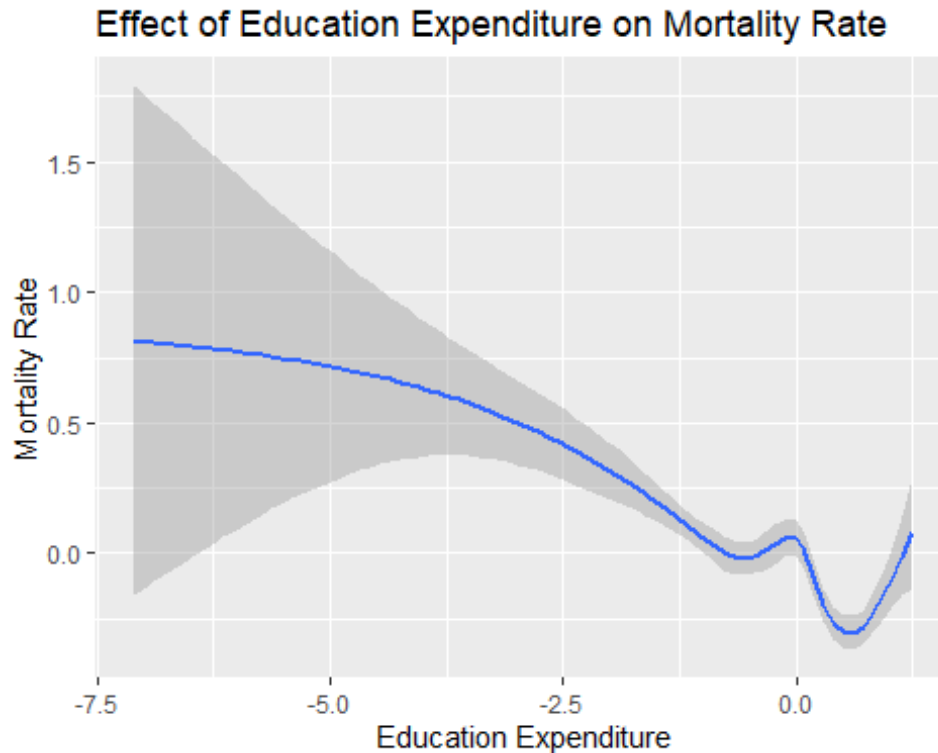
Examining the plot, it is evident that there is a discernible pattern in the distribution of Mortality Rate with respect to Literacy Rates. As Literacy Rates increase, there is a tendency for the Mortality Rate to decrease. This suggests a potential correlation between higher literacy levels and lower Mortality Rates, indicating that education and literacy may play a role in improving overall health outcomes.

However, it is important to note that the relationship between Mortality Rate and Literacy Rate may not be solely determined by literacy itself. Other confounding factors such as healthcare access, socioeconomic status, and healthcare utilization may also contribute to the observed distribution.

What is the effect of Education Expenditure on Mortality Rate?

```
ggplot(data=my_data_imputed, mapping= aes(x = education_expenditure, y = mortality_rate)) +
  geom_smooth() +
  xlab("Education Expenditure") +
  ylab("Mortality Rate") +
  ggtitle("Effect of Education Expenditure on Mortality Rate")

## `geom_smooth()` using method = 'gam' and formula = 'y ~ s(x, bs = "cs")'
```



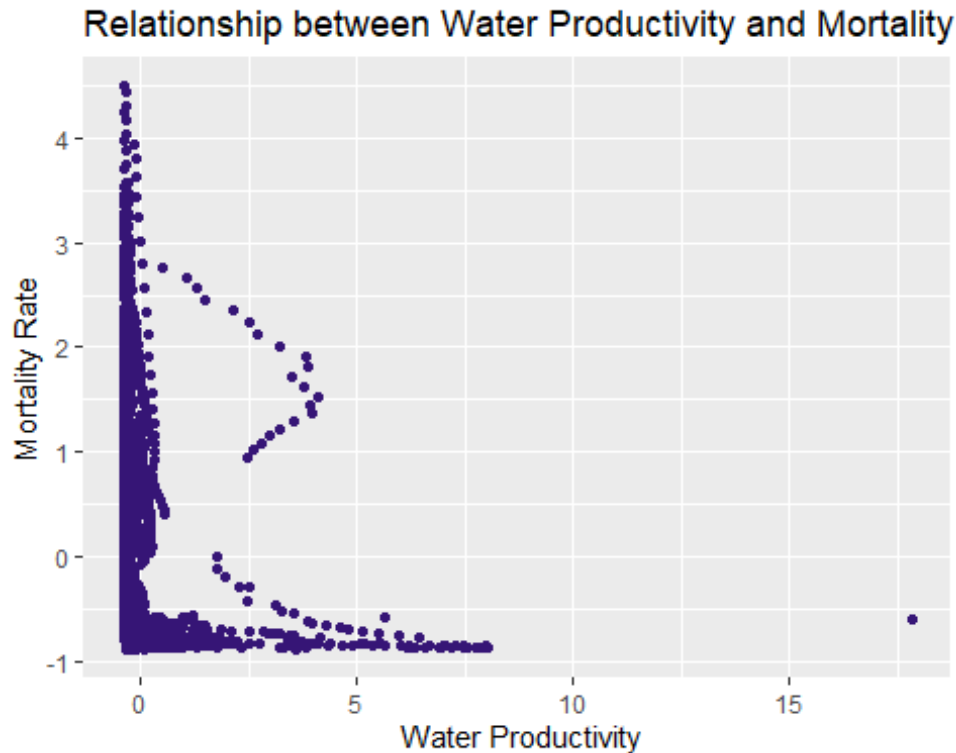
The plot visually represents the relationship between Education Expenditure and Mortality Rate. The x-axis represents Education Expenditure, while the y-axis represents Mortality Rate.

Upon examination of the plot, it is evident that there is an observable pattern indicating the effect of Education Expenditure on Mortality Rate. As Education Expenditure increases, there is a corresponding decrease in Mortality Rate. This suggests a potentially significant and meaningful relationship between higher investments in education and improved health outcomes.

The plot demonstrates that allocating resources towards education expenditure may play a crucial role in reducing Mortality Rate. However, it is important to note that this relationship may not be solely determined by education expenditure itself. As we observe the significant increase of the mortality rate, other factors such as healthcare infrastructure, socioeconomic conditions, and healthcare accessibility might also influence the observed relationship.

What is the relationship between Water Productivity and Mortality Rate?

```
ggplot(data=my_data_imputed,mapping = aes(x = water_productivity, y = mortality_rate)) +
  geom_point(color = "#361576") +
  xlab(" Water Productivity") +
  ylab("Mortality Rate") +
  ggtitle("Relationship between Water Productivity and Mortality Rate")
```

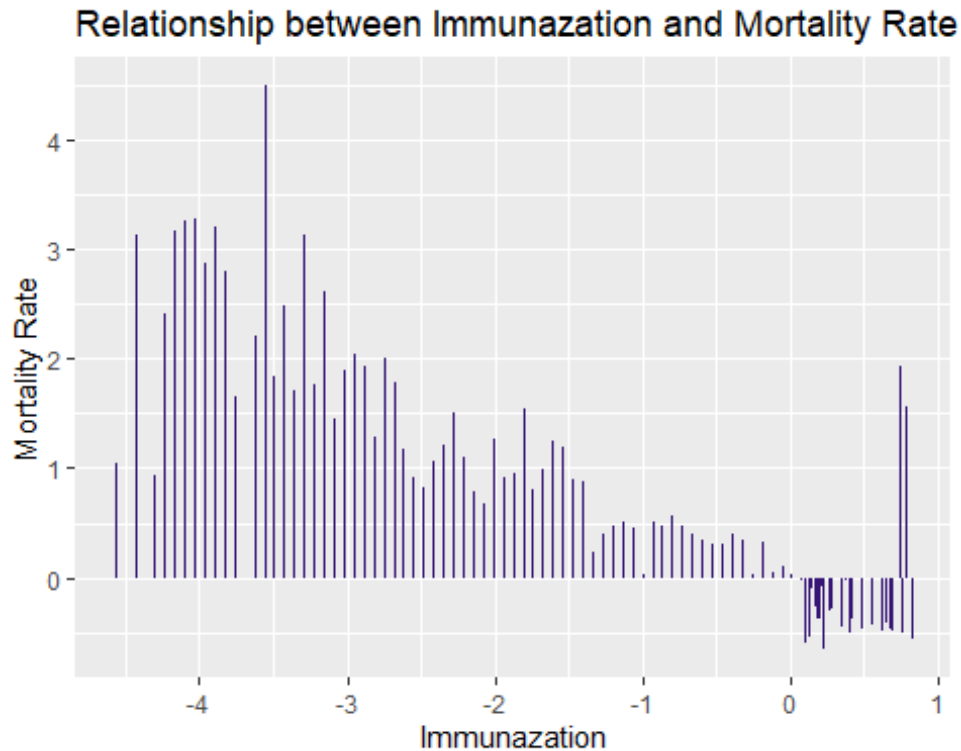


The plot visually represents the relationship between Water Productivity and Mortality Rate. The x-axis represents Water Productivity, while the y-axis represents Mortality Rate.

Upon examining the plot, it becomes apparent that there is a discernible pattern suggesting a relationship between Water Productivity and Mortality Rate. As Water Productivity increases, there is a tendency for the Mortality Rate to decrease. This implies that higher efficiency and productivity in water usage may be associated with improved health outcomes and reduced Mortality Rates.

What is the relationship between Immunazation and Mortality Rate?

```
ggplot(data= my_data_imputed, mapping = aes(x = immunazation,y = mortality_rate))+
  geom_bar(stat = "summary", fun = "mean",color="#361576")+
  xlab("Immunazation") +
  ylab("Mortality Rate") +
  ggtitle("Relationship between Immunazation and Mortality Rate")
```



The plot visually represents the relationship between Immunization and Mortality Rate. The x-axis represents the level of Immunization, while the y-axis represents the Mortality Rate.

Upon examining the plot, a clear pattern emerges, indicating a relationship between Immunization and Mortality Rate. As the level of Immunization increases, there is a corresponding decrease in the Mortality Rate. This suggests that higher rates of Immunization may be associated with lower Mortality Rates, highlighting the potential protective effect of immunization against preventable diseases.

```
# Store X and Y for Later use.
X = my_data_imputed[, 2:10]
y = my_data_imputed$mortality_rate

# Set the seed for reproducibility
set.seed(123)

#train test split
train_indices <- createDataPartition(y, p = 0.8, list = FALSE)
X_train <- X[train_indices,]
y_train <- y[train_indices]
X_test <- X[-train_indices,]
y_test <- y[-train_indices]

# Create and fit the linear regression model
model_LR <- train(X_train, y_train, method = "lm")

# Make predictions on the test set
```

```

y_pred_LR <- predict(model_LR, X_test)

# Evaluate the model using mean squared error
mse_LR <- mean((y_test - y_pred_LR)^2)

# Calculate R-squared
r2_LR <- cor(y_pred_LR, y_test)^2

# Create and fit the decison tree model
model_tree <- train(X_train, y_train, method = "rpart")

## Warning in nominalTrainWorkflow(x = x, y = y, wts = weights, info =
trainInfo,
## : There were missing values in resampled performance measures.

# Make predictions on the test set
y_pred_tree <- predict(model_tree, X_test)

# Evaluate the model using mean squared error
mse_tree <- mean((y_test - y_pred_tree)^2)

# Calculate R-squared
r2_tree <- cor(y_pred_tree, y_test)^2

# Create and fit the gradient boost model
model_gbm <- train(X_train, y_train, method = "gbm")

## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1           0.7803             nan      0.1000    0.0713
##      2           0.7223             nan      0.1000    0.0571
##      3           0.6753             nan      0.1000    0.0489
##      4           0.6342             nan      0.1000    0.0367
##      5           0.5963             nan      0.1000    0.0402
##      6           0.5628             nan      0.1000    0.0340
##      7           0.5328             nan      0.1000    0.0286
##      8           0.5055             nan      0.1000    0.0279
##      9           0.4828             nan      0.1000    0.0201
##     10           0.4612             nan      0.1000    0.0202
##     20           0.3258             nan      0.1000    0.0086
##     40           0.2398             nan      0.1000    0.0019
##     60           0.2196             nan      0.1000    0.0003
##     80           0.2099             nan      0.1000    0.0004
##    100           0.2035             nan      0.1000    0.0001
##    120           0.1992             nan      0.1000   -0.0000
##    140           0.1956             nan      0.1000    0.0002
##    150           0.1941             nan      0.1000   -0.0002
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1           0.7659             nan      0.1000    0.0844
##      2           0.6942             nan      0.1000    0.0733
##      3           0.6277             nan      0.1000    0.0634

```

##	4	0.5732	nan	0.1000	0.0531
##	5	0.5260	nan	0.1000	0.0451
##	6	0.4898	nan	0.1000	0.0369
##	7	0.4558	nan	0.1000	0.0335
##	8	0.4228	nan	0.1000	0.0290
##	9	0.3974	nan	0.1000	0.0235
##	10	0.3747	nan	0.1000	0.0217
##	20	0.2544	nan	0.1000	0.0061
##	40	0.1958	nan	0.1000	0.0004
##	60	0.1705	nan	0.1000	0.0007
##	80	0.1583	nan	0.1000	0.0001
##	100	0.1470	nan	0.1000	0.0000
##	120	0.1379	nan	0.1000	0.0008
##	140	0.1274	nan	0.1000	-0.0000
##	150	0.1240	nan	0.1000	0.0001
##					
##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	0.7514	nan	0.1000	0.0978
##	2	0.6712	nan	0.1000	0.0785
##	3	0.6010	nan	0.1000	0.0615
##	4	0.5439	nan	0.1000	0.0535
##	5	0.4922	nan	0.1000	0.0522
##	6	0.4527	nan	0.1000	0.0410
##	7	0.4181	nan	0.1000	0.0311
##	8	0.3893	nan	0.1000	0.0265
##	9	0.3625	nan	0.1000	0.0229
##	10	0.3366	nan	0.1000	0.0229
##	20	0.2219	nan	0.1000	0.0055
##	40	0.1654	nan	0.1000	0.0005
##	60	0.1419	nan	0.1000	0.0003
##	80	0.1262	nan	0.1000	0.0018
##	100	0.1153	nan	0.1000	0.0001
##	120	0.1068	nan	0.1000	-0.0000
##	140	0.0987	nan	0.1000	-0.0001
##	150	0.0959	nan	0.1000	0.0000
##					
##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	0.7879	nan	0.1000	0.0692
##	2	0.7283	nan	0.1000	0.0568
##	3	0.6765	nan	0.1000	0.0453
##	4	0.6375	nan	0.1000	0.0363
##	5	0.5964	nan	0.1000	0.0398
##	6	0.5620	nan	0.1000	0.0337
##	7	0.5319	nan	0.1000	0.0299
##	8	0.5020	nan	0.1000	0.0291
##	9	0.4770	nan	0.1000	0.0225
##	10	0.4564	nan	0.1000	0.0197
##	20	0.3237	nan	0.1000	0.0075
##	40	0.2473	nan	0.1000	0.0002
##	60	0.2268	nan	0.1000	0.0001


```

##      80      0.2162      nan      0.1000     -0.0000
##     100      0.2099      nan      0.1000      0.0001
##     120      0.2056      nan      0.1000     -0.0008
##     140      0.2026      nan      0.1000      0.0002
##     150      0.2013      nan      0.1000      0.0001
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1      0.7723      nan      0.1000      0.0902
##      2      0.7048      nan      0.1000      0.0693
##      3      0.6430      nan      0.1000      0.0657
##      4      0.5874      nan      0.1000      0.0529
##      5      0.5408      nan      0.1000      0.0448
##      6      0.4978      nan      0.1000      0.0437
##      7      0.4626      nan      0.1000      0.0362
##      8      0.4321      nan      0.1000      0.0304
##      9      0.4060      nan      0.1000      0.0264
##     10      0.3834      nan      0.1000      0.0243
##     20      0.2570      nan      0.1000      0.0067
##     40      0.1898      nan      0.1000      0.0014
##     60      0.1656      nan      0.1000      0.0005
##     80      0.1539      nan      0.1000      0.0002
##    100      0.1411      nan      0.1000     -0.0000
##    120      0.1342      nan      0.1000     -0.0001
##    140      0.1284      nan      0.1000      0.0000
##    150      0.1260      nan      0.1000      0.0001
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1      0.7656      nan      0.1000      0.0981
##      2      0.6878      nan      0.1000      0.0801
##      3      0.6229      nan      0.1000      0.0616
##      4      0.5637      nan      0.1000      0.0568
##      5      0.5147      nan      0.1000      0.0497
##      6      0.4739      nan      0.1000      0.0389
##      7      0.4345      nan      0.1000      0.0392
##      8      0.4020      nan      0.1000      0.0318
##      9      0.3755      nan      0.1000      0.0261
##     10      0.3505      nan      0.1000      0.0240
##     20      0.2310      nan      0.1000      0.0059
##     40      0.1668      nan      0.1000      0.0012
##     60      0.1452      nan      0.1000      0.0007
##     80      0.1303      nan      0.1000     -0.0001
##    100      0.1176      nan      0.1000      0.0002
##    120      0.1085      nan      0.1000     -0.0002
##    140      0.1007      nan      0.1000      0.0001
##    150      0.0975      nan      0.1000      0.0000
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1      0.8103      nan      0.1000      0.0763
##      2      0.7459      nan      0.1000      0.0633
##      3      0.6922      nan      0.1000      0.0554

```

##	4	0.6460	nan	0.1000	0.0479
##	5	0.6048	nan	0.1000	0.0389
##	6	0.5689	nan	0.1000	0.0363
##	7	0.5402	nan	0.1000	0.0295
##	8	0.5118	nan	0.1000	0.0289
##	9	0.4865	nan	0.1000	0.0241
##	10	0.4658	nan	0.1000	0.0198
##	20	0.3237	nan	0.1000	0.0082
##	40	0.2375	nan	0.1000	0.0012
##	60	0.2178	nan	0.1000	0.0005
##	80	0.2084	nan	0.1000	0.0005
##	100	0.2018	nan	0.1000	-0.0001
##	120	0.1964	nan	0.1000	-0.0001
##	140	0.1920	nan	0.1000	0.0001
##	150	0.1903	nan	0.1000	0.0001
##					
##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	0.7928	nan	0.1000	0.0942
##	2	0.7166	nan	0.1000	0.0753
##	3	0.6473	nan	0.1000	0.0690
##	4	0.5929	nan	0.1000	0.0488
##	5	0.5435	nan	0.1000	0.0488
##	6	0.5044	nan	0.1000	0.0375
##	7	0.4669	nan	0.1000	0.0365
##	8	0.4370	nan	0.1000	0.0282
##	9	0.4152	nan	0.1000	0.0217
##	10	0.3902	nan	0.1000	0.0229
##	20	0.2580	nan	0.1000	0.0069
##	40	0.1925	nan	0.1000	0.0015
##	60	0.1727	nan	0.1000	0.0007
##	80	0.1587	nan	0.1000	-0.0000
##	100	0.1505	nan	0.1000	0.0000
##	120	0.1416	nan	0.1000	0.0001
##	140	0.1339	nan	0.1000	0.0001
##	150	0.1309	nan	0.1000	0.0004
##					
##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	0.7853	nan	0.1000	0.1012
##	2	0.6985	nan	0.1000	0.0837
##	3	0.6276	nan	0.1000	0.0715
##	4	0.5673	nan	0.1000	0.0558
##	5	0.5164	nan	0.1000	0.0513
##	6	0.4724	nan	0.1000	0.0410
##	7	0.4343	nan	0.1000	0.0372
##	8	0.4030	nan	0.1000	0.0312
##	9	0.3761	nan	0.1000	0.0262
##	10	0.3524	nan	0.1000	0.0250
##	20	0.2270	nan	0.1000	0.0054
##	40	0.1635	nan	0.1000	0.0009
##	60	0.1441	nan	0.1000	0.0006

##	80	0.1320	nan	0.1000	-0.0001
##	100	0.1198	nan	0.1000	0.0002
##	120	0.1099	nan	0.1000	0.0001
##	140	0.1012	nan	0.1000	0.0001
##	150	0.0975	nan	0.1000	0.0004
##					
##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	0.8401	nan	0.1000	0.0744
##	2	0.7762	nan	0.1000	0.0634
##	3	0.7194	nan	0.1000	0.0573
##	4	0.6723	nan	0.1000	0.0476
##	5	0.6318	nan	0.1000	0.0395
##	6	0.5909	nan	0.1000	0.0393
##	7	0.5588	nan	0.1000	0.0327
##	8	0.5288	nan	0.1000	0.0284
##	9	0.5024	nan	0.1000	0.0260
##	10	0.4808	nan	0.1000	0.0214
##	20	0.3381	nan	0.1000	0.0090
##	40	0.2509	nan	0.1000	0.0015
##	60	0.2285	nan	0.1000	0.0004
##	80	0.2183	nan	0.1000	0.0001
##	100	0.2106	nan	0.1000	0.0001
##	120	0.2056	nan	0.1000	-0.0001
##	140	0.2014	nan	0.1000	0.0002
##	150	0.1995	nan	0.1000	-0.0000
##					
##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	0.8227	nan	0.1000	0.0898
##	2	0.7461	nan	0.1000	0.0779
##	3	0.6778	nan	0.1000	0.0687
##	4	0.6206	nan	0.1000	0.0563
##	5	0.5716	nan	0.1000	0.0489
##	6	0.5314	nan	0.1000	0.0407
##	7	0.4914	nan	0.1000	0.0384
##	8	0.4568	nan	0.1000	0.0323
##	9	0.4283	nan	0.1000	0.0279
##	10	0.4040	nan	0.1000	0.0235
##	20	0.2698	nan	0.1000	0.0053
##	40	0.1993	nan	0.1000	0.0012
##	60	0.1779	nan	0.1000	0.0003
##	80	0.1637	nan	0.1000	0.0002
##	100	0.1541	nan	0.1000	-0.0000
##	120	0.1437	nan	0.1000	-0.0001
##	140	0.1359	nan	0.1000	-0.0001
##	150	0.1334	nan	0.1000	0.0001
##					
##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	0.8128	nan	0.1000	0.0996
##	2	0.7252	nan	0.1000	0.0860
##	3	0.6536	nan	0.1000	0.0768

##	4	0.5911	nan	0.1000	0.0564
##	5	0.5383	nan	0.1000	0.0558
##	6	0.4923	nan	0.1000	0.0404
##	7	0.4551	nan	0.1000	0.0348
##	8	0.4223	nan	0.1000	0.0340
##	9	0.3920	nan	0.1000	0.0277
##	10	0.3671	nan	0.1000	0.0236
##	20	0.2328	nan	0.1000	0.0060
##	40	0.1652	nan	0.1000	0.0010
##	60	0.1418	nan	0.1000	0.0004
##	80	0.1296	nan	0.1000	-0.0002
##	100	0.1215	nan	0.1000	0.0003
##	120	0.1130	nan	0.1000	0.0004
##	140	0.1038	nan	0.1000	-0.0003
##	150	0.1005	nan	0.1000	0.0001
##					
##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	0.8846	nan	0.1000	0.0846
##	2	0.8121	nan	0.1000	0.0708
##	3	0.7518	nan	0.1000	0.0614
##	4	0.6984	nan	0.1000	0.0518
##	5	0.6557	nan	0.1000	0.0446
##	6	0.6129	nan	0.1000	0.0425
##	7	0.5732	nan	0.1000	0.0373
##	8	0.5413	nan	0.1000	0.0328
##	9	0.5120	nan	0.1000	0.0303
##	10	0.4864	nan	0.1000	0.0253
##	20	0.3230	nan	0.1000	0.0095
##	40	0.2259	nan	0.1000	0.0009
##	60	0.2036	nan	0.1000	0.0002
##	80	0.1951	nan	0.1000	0.0003
##	100	0.1899	nan	0.1000	-0.0000
##	120	0.1857	nan	0.1000	0.0002
##	140	0.1828	nan	0.1000	-0.0000
##	150	0.1813	nan	0.1000	-0.0002
##					
##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	0.8645	nan	0.1000	0.0949
##	2	0.7758	nan	0.1000	0.0920
##	3	0.7040	nan	0.1000	0.0691
##	4	0.6412	nan	0.1000	0.0609
##	5	0.5878	nan	0.1000	0.0553
##	6	0.5364	nan	0.1000	0.0462
##	7	0.4928	nan	0.1000	0.0416
##	8	0.4550	nan	0.1000	0.0351
##	9	0.4245	nan	0.1000	0.0288
##	10	0.3969	nan	0.1000	0.0276
##	20	0.2464	nan	0.1000	0.0069
##	40	0.1819	nan	0.1000	-0.0002
##	60	0.1616	nan	0.1000	0.0000

```

##      80      0.1509      nan      0.1000      0.0001
##     100      0.1403      nan      0.1000      0.0000
##     120      0.1316      nan      0.1000      0.0002
##     140      0.1254      nan      0.1000      0.0002
##     150      0.1220      nan      0.1000      0.0002
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1      0.8532      nan      0.1000      0.1111
##      2      0.7586      nan      0.1000      0.0897
##      3      0.6794      nan      0.1000      0.0788
##      4      0.6092      nan      0.1000      0.0730
##      5      0.5489      nan      0.1000      0.0573
##      6      0.5008      nan      0.1000      0.0449
##      7      0.4582      nan      0.1000      0.0432
##      8      0.4194      nan      0.1000      0.0348
##      9      0.3885      nan      0.1000      0.0315
##     10      0.3583      nan      0.1000      0.0293
##     20      0.2220      nan      0.1000      0.0054
##     40      0.1538      nan      0.1000      0.0032
##     60      0.1335      nan      0.1000      0.0004
##     80      0.1202      nan      0.1000      0.0001
##    100      0.1099      nan      0.1000      0.0004
##    120      0.1005      nan      0.1000      0.0003
##    140      0.0934      nan      0.1000      0.0002
##    150      0.0905      nan      0.1000     -0.0001
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1      0.8346      nan      0.1000      0.0747
##      2      0.7723      nan      0.1000      0.0601
##      3      0.7200      nan      0.1000      0.0518
##      4      0.6751      nan      0.1000      0.0406
##      5      0.6331      nan      0.1000      0.0421
##      6      0.5962      nan      0.1000      0.0346
##      7      0.5661      nan      0.1000      0.0289
##      8      0.5374      nan      0.1000      0.0286
##      9      0.5133      nan      0.1000      0.0243
##     10      0.4909      nan      0.1000      0.0213
##     20      0.3437      nan      0.1000      0.0074
##     40      0.2543      nan      0.1000      0.0023
##     60      0.2303      nan      0.1000      0.0008
##     80      0.2201      nan      0.1000      0.0003
##    100      0.2142      nan      0.1000     -0.0002
##    120      0.2102      nan      0.1000      0.0000
##    140      0.2069      nan      0.1000      0.0000
##    150      0.2054      nan      0.1000     -0.0007
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1      0.8174      nan      0.1000      0.0805
##      2      0.7358      nan      0.1000      0.0834
##      3      0.6704      nan      0.1000      0.0633

```

##	4	0.6152	nan	0.1000	0.0540
##	5	0.5659	nan	0.1000	0.0505
##	6	0.5190	nan	0.1000	0.0443
##	7	0.4845	nan	0.1000	0.0320
##	8	0.4556	nan	0.1000	0.0281
##	9	0.4299	nan	0.1000	0.0255
##	10	0.4054	nan	0.1000	0.0232
##	20	0.2689	nan	0.1000	0.0059
##	40	0.1991	nan	0.1000	0.0015
##	60	0.1761	nan	0.1000	0.0007
##	80	0.1609	nan	0.1000	0.0004
##	100	0.1498	nan	0.1000	0.0002
##	120	0.1418	nan	0.1000	-0.0000
##	140	0.1335	nan	0.1000	0.0001
##	150	0.1302	nan	0.1000	-0.0001
##					
##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	0.8042	nan	0.1000	0.0984
##	2	0.7173	nan	0.1000	0.0884
##	3	0.6465	nan	0.1000	0.0726
##	4	0.5812	nan	0.1000	0.0608
##	5	0.5271	nan	0.1000	0.0490
##	6	0.4845	nan	0.1000	0.0430
##	7	0.4479	nan	0.1000	0.0331
##	8	0.4164	nan	0.1000	0.0314
##	9	0.3889	nan	0.1000	0.0253
##	10	0.3652	nan	0.1000	0.0233
##	20	0.2350	nan	0.1000	0.0064
##	40	0.1736	nan	0.1000	0.0005
##	60	0.1498	nan	0.1000	0.0005
##	80	0.1345	nan	0.1000	0.0009
##	100	0.1212	nan	0.1000	0.0002
##	120	0.1108	nan	0.1000	0.0001
##	140	0.1034	nan	0.1000	0.0001
##	150	0.1002	nan	0.1000	0.0001
##					
##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	0.7692	nan	0.1000	0.0696
##	2	0.7068	nan	0.1000	0.0592
##	3	0.6562	nan	0.1000	0.0511
##	4	0.6141	nan	0.1000	0.0398
##	5	0.5783	nan	0.1000	0.0318
##	6	0.5453	nan	0.1000	0.0342
##	7	0.5145	nan	0.1000	0.0307
##	8	0.4894	nan	0.1000	0.0248
##	9	0.4679	nan	0.1000	0.0211
##	10	0.4463	nan	0.1000	0.0199
##	20	0.3169	nan	0.1000	0.0077
##	40	0.2357	nan	0.1000	0.0016
##	60	0.2134	nan	0.1000	0.0002

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##      80      0.2041      nan      0.1000      0.0002
##     100      0.1985      nan      0.1000     -0.0001
##     120      0.1945      nan      0.1000     -0.0001
##     140      0.1913      nan      0.1000     -0.0001
##     150      0.1897      nan      0.1000     -0.0000
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1      0.7553      nan      0.1000      0.0838
##      2      0.6858      nan      0.1000      0.0688
##      3      0.6292      nan      0.1000      0.0561
##      4      0.5766      nan      0.1000      0.0548
##      5      0.5316      nan      0.1000      0.0432
##      6      0.4930      nan      0.1000      0.0409
##      7      0.4583      nan      0.1000      0.0340
##      8      0.4312      nan      0.1000      0.0246
##      9      0.4050      nan      0.1000      0.0261
##     10      0.3827      nan      0.1000      0.0210
##     20      0.2544      nan      0.1000      0.0070
##     40      0.1932      nan      0.1000      0.0013
##     60      0.1701      nan      0.1000      0.0006
##     80      0.1568      nan      0.1000      0.0007
##    100      0.1471      nan      0.1000     -0.0003
##    120      0.1377      nan      0.1000      0.0000
##    140      0.1298      nan      0.1000      0.0006
##    150      0.1271      nan      0.1000      0.0001
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1      0.7451      nan      0.1000      0.0929
##      2      0.6656      nan      0.1000      0.0804
##      3      0.5999      nan      0.1000      0.0639
##      4      0.5437      nan      0.1000      0.0545
##      5      0.4942      nan      0.1000      0.0472
##      6      0.4511      nan      0.1000      0.0434
##      7      0.4154      nan      0.1000      0.0368
##      8      0.3847      nan      0.1000      0.0291
##      9      0.3585      nan      0.1000      0.0249
##     10      0.3351      nan      0.1000      0.0200
##     20      0.2206      nan      0.1000      0.0062
##     40      0.1591      nan      0.1000      0.0016
##     60      0.1384      nan      0.1000      0.0007
##     80      0.1234      nan      0.1000      0.0006
##    100      0.1123      nan      0.1000     -0.0002
##    120      0.1047      nan      0.1000      0.0001
##    140      0.0965      nan      0.1000     -0.0000
##    150      0.0928      nan      0.1000      0.0000
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1      0.8071      nan      0.1000      0.0722
##      2      0.7437      nan      0.1000      0.0595
##      3      0.6902      nan      0.1000      0.0537

```

##	4	0.6420	nan	0.1000	0.0460
##	5	0.6051	nan	0.1000	0.0369
##	6	0.5732	nan	0.1000	0.0319
##	7	0.5438	nan	0.1000	0.0288
##	8	0.5126	nan	0.1000	0.0300
##	9	0.4890	nan	0.1000	0.0213
##	10	0.4666	nan	0.1000	0.0200
##	20	0.3253	nan	0.1000	0.0099
##	40	0.2347	nan	0.1000	0.0011
##	60	0.2119	nan	0.1000	0.0002
##	80	0.2026	nan	0.1000	0.0003
##	100	0.1956	nan	0.1000	0.0004
##	120	0.1915	nan	0.1000	-0.0000
##	140	0.1878	nan	0.1000	-0.0002
##	150	0.1865	nan	0.1000	-0.0001
##					
##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	0.7880	nan	0.1000	0.0917
##	2	0.7121	nan	0.1000	0.0701
##	3	0.6471	nan	0.1000	0.0632
##	4	0.5895	nan	0.1000	0.0563
##	5	0.5433	nan	0.1000	0.0438
##	6	0.4995	nan	0.1000	0.0405
##	7	0.4636	nan	0.1000	0.0365
##	8	0.4318	nan	0.1000	0.0287
##	9	0.4042	nan	0.1000	0.0266
##	10	0.3811	nan	0.1000	0.0206
##	20	0.2511	nan	0.1000	0.0058
##	40	0.1891	nan	0.1000	0.0012
##	60	0.1684	nan	0.1000	0.0008
##	80	0.1543	nan	0.1000	-0.0002
##	100	0.1447	nan	0.1000	-0.0002
##	120	0.1374	nan	0.1000	-0.0003
##	140	0.1294	nan	0.1000	0.0000
##	150	0.1258	nan	0.1000	0.0001
##					
##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	0.7794	nan	0.1000	0.1019
##	2	0.6958	nan	0.1000	0.0801
##	3	0.6194	nan	0.1000	0.0733
##	4	0.5589	nan	0.1000	0.0596
##	5	0.5072	nan	0.1000	0.0492
##	6	0.4626	nan	0.1000	0.0430
##	7	0.4258	nan	0.1000	0.0357
##	8	0.3950	nan	0.1000	0.0293
##	9	0.3686	nan	0.1000	0.0240
##	10	0.3442	nan	0.1000	0.0211
##	20	0.2192	nan	0.1000	0.0041
##	40	0.1586	nan	0.1000	0.0011
##	60	0.1394	nan	0.1000	0.0008


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##      80      0.1270      nan      0.1000      0.0003
##     100      0.1165      nan      0.1000     -0.0003
##     120      0.1071      nan      0.1000      0.0004
##     140      0.0998      nan      0.1000     -0.0003
##     150      0.0965      nan      0.1000      0.0001
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1      0.8015      nan      0.1000      0.0742
##      2      0.7359      nan      0.1000      0.0625
##      3      0.6831      nan      0.1000      0.0510
##      4      0.6355      nan      0.1000      0.0489
##      5      0.5971      nan      0.1000      0.0378
##      6      0.5630      nan      0.1000      0.0344
##      7      0.5310      nan      0.1000      0.0305
##      8      0.5012      nan      0.1000      0.0276
##      9      0.4771      nan      0.1000      0.0245
##     10      0.4515      nan      0.1000      0.0241
##     20      0.3150      nan      0.1000      0.0093
##     40      0.2336      nan      0.1000      0.0013
##     60      0.2135      nan      0.1000     -0.0002
##     80      0.2045      nan      0.1000      0.0002
##    100      0.1987      nan      0.1000      0.0002
##    120      0.1948      nan      0.1000      0.0001
##    140      0.1921      nan      0.1000     -0.0000
##    150      0.1908      nan      0.1000     -0.0000
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1      0.7880      nan      0.1000      0.0868
##      2      0.7079      nan      0.1000      0.0795
##      3      0.6415      nan      0.1000      0.0695
##      4      0.5906      nan      0.1000      0.0517
##      5      0.5432      nan      0.1000      0.0467
##      6      0.5001      nan      0.1000      0.0455
##      7      0.4610      nan      0.1000      0.0379
##      8      0.4277      nan      0.1000      0.0325
##      9      0.3990      nan      0.1000      0.0305
##     10      0.3764      nan      0.1000      0.0208
##     20      0.2480      nan      0.1000      0.0065
##     40      0.1912      nan      0.1000      0.0005
##     60      0.1712      nan      0.1000      0.0004
##     80      0.1605      nan      0.1000     -0.0007
##    100      0.1497      nan      0.1000      0.0001
##    120      0.1435      nan      0.1000      0.0000
##    140      0.1366      nan      0.1000      0.0003
##    150      0.1334      nan      0.1000      0.0003
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1      0.7766      nan      0.1000      0.0955
##      2      0.6932      nan      0.1000      0.0868
##      3      0.6191      nan      0.1000      0.0740

```

##	4	0.5578	nan	0.1000	0.0597
##	5	0.5060	nan	0.1000	0.0463
##	6	0.4615	nan	0.1000	0.0409
##	7	0.4229	nan	0.1000	0.0372
##	8	0.3900	nan	0.1000	0.0328
##	9	0.3627	nan	0.1000	0.0241
##	10	0.3398	nan	0.1000	0.0227
##	20	0.2210	nan	0.1000	0.0056
##	40	0.1672	nan	0.1000	0.0010
##	60	0.1490	nan	0.1000	-0.0000
##	80	0.1348	nan	0.1000	0.0000
##	100	0.1233	nan	0.1000	0.0002
##	120	0.1123	nan	0.1000	0.0001
##	140	0.1032	nan	0.1000	0.0002
##	150	0.1000	nan	0.1000	0.0000
##					
##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	0.8288	nan	0.1000	0.0834
##	2	0.7649	nan	0.1000	0.0643
##	3	0.7037	nan	0.1000	0.0589
##	4	0.6531	nan	0.1000	0.0493
##	5	0.6129	nan	0.1000	0.0404
##	6	0.5783	nan	0.1000	0.0349
##	7	0.5451	nan	0.1000	0.0325
##	8	0.5152	nan	0.1000	0.0274
##	9	0.4890	nan	0.1000	0.0249
##	10	0.4658	nan	0.1000	0.0222
##	20	0.3183	nan	0.1000	0.0094
##	40	0.2276	nan	0.1000	0.0012
##	60	0.2066	nan	0.1000	0.0002
##	80	0.1985	nan	0.1000	0.0003
##	100	0.1931	nan	0.1000	0.0001
##	120	0.1893	nan	0.1000	-0.0000
##	140	0.1857	nan	0.1000	0.0001
##	150	0.1844	nan	0.1000	-0.0004
##					
##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	0.8140	nan	0.1000	0.0980
##	2	0.7317	nan	0.1000	0.0812
##	3	0.6602	nan	0.1000	0.0716
##	4	0.6001	nan	0.1000	0.0584
##	5	0.5514	nan	0.1000	0.0493
##	6	0.5091	nan	0.1000	0.0425
##	7	0.4697	nan	0.1000	0.0397
##	8	0.4394	nan	0.1000	0.0298
##	9	0.4081	nan	0.1000	0.0291
##	10	0.3838	nan	0.1000	0.0231
##	20	0.2462	nan	0.1000	0.0055
##	40	0.1811	nan	0.1000	0.0008
##	60	0.1594	nan	0.1000	0.0002

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##      80      0.1486      nan      0.1000      0.0001
##     100      0.1394      nan      0.1000      0.0007
##     120      0.1302      nan      0.1000      0.0005
##     140      0.1232      nan      0.1000     -0.0001
##     150      0.1200      nan      0.1000      0.0004
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1      0.7987      nan      0.1000      0.1083
##      2      0.7066      nan      0.1000      0.0914
##      3      0.6323      nan      0.1000      0.0747
##      4      0.5668      nan      0.1000      0.0639
##      5      0.5145      nan      0.1000      0.0473
##      6      0.4691      nan      0.1000      0.0480
##      7      0.4312      nan      0.1000      0.0371
##      8      0.3961      nan      0.1000      0.0337
##      9      0.3669      nan      0.1000      0.0289
##     10      0.3403      nan      0.1000      0.0243
##     20      0.2157      nan      0.1000      0.0066
##     40      0.1536      nan      0.1000      0.0013
##     60      0.1360      nan      0.1000      0.0002
##     80      0.1194      nan      0.1000      0.0003
##    100      0.1084      nan      0.1000      0.0000
##    120      0.1015      nan      0.1000     -0.0001
##    140      0.0943      nan      0.1000      0.0000
##    150      0.0915      nan      0.1000      0.0000
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1      0.7820      nan      0.1000      0.0726
##      2      0.7205      nan      0.1000      0.0597
##      3      0.6693      nan      0.1000      0.0488
##      4      0.6265      nan      0.1000      0.0425
##      5      0.5875      nan      0.1000      0.0396
##      6      0.5520      nan      0.1000      0.0339
##      7      0.5184      nan      0.1000      0.0316
##      8      0.4893      nan      0.1000      0.0259
##      9      0.4645      nan      0.1000      0.0226
##     10      0.4429      nan      0.1000      0.0215
##     20      0.3050      nan      0.1000      0.0078
##     40      0.2232      nan      0.1000      0.0008
##     60      0.2027      nan      0.1000      0.0004
##     80      0.1946      nan      0.1000      0.0002
##    100      0.1895      nan      0.1000      0.0001
##    120      0.1860      nan      0.1000      0.0000
##    140      0.1831      nan      0.1000     -0.0002
##    150      0.1820      nan      0.1000     -0.0001
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1      0.7731      nan      0.1000      0.0838
##      2      0.6984      nan      0.1000      0.0764
##      3      0.6331      nan      0.1000      0.0637

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##	4	0.5807	nan	0.1000	0.0517
##	5	0.5323	nan	0.1000	0.0477
##	6	0.4914	nan	0.1000	0.0382
##	7	0.4518	nan	0.1000	0.0366
##	8	0.4201	nan	0.1000	0.0320
##	9	0.3941	nan	0.1000	0.0265
##	10	0.3717	nan	0.1000	0.0221
##	20	0.2385	nan	0.1000	0.0059
##	40	0.1787	nan	0.1000	0.0014
##	60	0.1591	nan	0.1000	0.0004
##	80	0.1481	nan	0.1000	0.0005
##	100	0.1390	nan	0.1000	-0.0001
##	120	0.1307	nan	0.1000	0.0001
##	140	0.1230	nan	0.1000	-0.0000
##	150	0.1196	nan	0.1000	-0.0000
##					
##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	0.7596	nan	0.1000	0.1008
##	2	0.6755	nan	0.1000	0.0750
##	3	0.6071	nan	0.1000	0.0676
##	4	0.5487	nan	0.1000	0.0566
##	5	0.4972	nan	0.1000	0.0457
##	6	0.4527	nan	0.1000	0.0413
##	7	0.4135	nan	0.1000	0.0366
##	8	0.3819	nan	0.1000	0.0331
##	9	0.3557	nan	0.1000	0.0253
##	10	0.3329	nan	0.1000	0.0238
##	20	0.2091	nan	0.1000	0.0066
##	40	0.1543	nan	0.1000	0.0006
##	60	0.1328	nan	0.1000	0.0008
##	80	0.1208	nan	0.1000	0.0004
##	100	0.1102	nan	0.1000	0.0002
##	120	0.1018	nan	0.1000	0.0000
##	140	0.0949	nan	0.1000	0.0002
##	150	0.0915	nan	0.1000	0.0004
##					
##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	0.8646	nan	0.1000	0.0898
##	2	0.7884	nan	0.1000	0.0692
##	3	0.7239	nan	0.1000	0.0615
##	4	0.6724	nan	0.1000	0.0518
##	5	0.6265	nan	0.1000	0.0466
##	6	0.5890	nan	0.1000	0.0351
##	7	0.5569	nan	0.1000	0.0325
##	8	0.5294	nan	0.1000	0.0284
##	9	0.5009	nan	0.1000	0.0285
##	10	0.4769	nan	0.1000	0.0237
##	20	0.3280	nan	0.1000	0.0080
##	40	0.2437	nan	0.1000	0.0010
##	60	0.2225	nan	0.1000	0.0007

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##      80      0.2105      nan      0.1000      0.0005
##     100      0.2025      nan      0.1000      0.0001
##     120      0.1976      nan      0.1000      0.0003
##     140      0.1939      nan      0.1000      0.0000
##     150      0.1923      nan      0.1000     -0.0000
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1      0.8533      nan      0.1000      0.0990
##      2      0.7691      nan      0.1000      0.0774
##      3      0.6922      nan      0.1000      0.0716
##      4      0.6275      nan      0.1000      0.0644
##      5      0.5752      nan      0.1000      0.0544
##      6      0.5311      nan      0.1000      0.0422
##      7      0.4914      nan      0.1000      0.0375
##      8      0.4563      nan      0.1000      0.0319
##      9      0.4272      nan      0.1000      0.0294
##     10      0.3988      nan      0.1000      0.0276
##     20      0.2691      nan      0.1000      0.0067
##     40      0.1982      nan      0.1000      0.0020
##     60      0.1778      nan      0.1000      0.0007
##     80      0.1671      nan      0.1000      0.0005
##    100      0.1556      nan      0.1000      0.0004
##    120      0.1459      nan      0.1000      0.0004
##    140      0.1375      nan      0.1000      0.0001
##    150      0.1340      nan      0.1000     -0.0002
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1      0.8377      nan      0.1000      0.1085
##      2      0.7396      nan      0.1000      0.0934
##      3      0.6654      nan      0.1000      0.0717
##      4      0.6006      nan      0.1000      0.0627
##      5      0.5406      nan      0.1000      0.0603
##      6      0.4898      nan      0.1000      0.0451
##      7      0.4500      nan      0.1000      0.0406
##      8      0.4163      nan      0.1000      0.0329
##      9      0.3892      nan      0.1000      0.0253
##     10      0.3640      nan      0.1000      0.0256
##     20      0.2353      nan      0.1000      0.0061
##     40      0.1687      nan      0.1000      0.0018
##     60      0.1449      nan      0.1000      0.0004
##     80      0.1320      nan      0.1000      0.0001
##    100      0.1215      nan      0.1000      0.0003
##    120      0.1122      nan      0.1000      0.0001
##    140      0.1031      nan      0.1000      0.0005
##    150      0.0998      nan      0.1000      0.0000
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1      0.7816      nan      0.1000      0.0766
##      2      0.7190      nan      0.1000      0.0602
##      3      0.6672      nan      0.1000      0.0519

```

##	4	0.6229	nan	0.1000	0.0413
##	5	0.5858	nan	0.1000	0.0366
##	6	0.5502	nan	0.1000	0.0320
##	7	0.5176	nan	0.1000	0.0324
##	8	0.4913	nan	0.1000	0.0247
##	9	0.4689	nan	0.1000	0.0218
##	10	0.4501	nan	0.1000	0.0199
##	20	0.3199	nan	0.1000	0.0092
##	40	0.2402	nan	0.1000	0.0015
##	60	0.2202	nan	0.1000	0.0004
##	80	0.2096	nan	0.1000	0.0005
##	100	0.2029	nan	0.1000	0.0003
##	120	0.1976	nan	0.1000	0.0003
##	140	0.1940	nan	0.1000	-0.0002
##	150	0.1925	nan	0.1000	-0.0003
##					
##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	0.7678	nan	0.1000	0.0893
##	2	0.6969	nan	0.1000	0.0660
##	3	0.6340	nan	0.1000	0.0558
##	4	0.5824	nan	0.1000	0.0495
##	5	0.5368	nan	0.1000	0.0461
##	6	0.4948	nan	0.1000	0.0419
##	7	0.4598	nan	0.1000	0.0369
##	8	0.4281	nan	0.1000	0.0307
##	9	0.4027	nan	0.1000	0.0228
##	10	0.3757	nan	0.1000	0.0261
##	20	0.2520	nan	0.1000	0.0074
##	40	0.1913	nan	0.1000	0.0013
##	60	0.1719	nan	0.1000	0.0003
##	80	0.1616	nan	0.1000	0.0003
##	100	0.1535	nan	0.1000	-0.0002
##	120	0.1435	nan	0.1000	-0.0004
##	140	0.1360	nan	0.1000	-0.0001
##	150	0.1324	nan	0.1000	0.0003
##					
##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	0.7581	nan	0.1000	0.1013
##	2	0.6792	nan	0.1000	0.0744
##	3	0.6100	nan	0.1000	0.0631
##	4	0.5516	nan	0.1000	0.0564
##	5	0.4984	nan	0.1000	0.0490
##	6	0.4542	nan	0.1000	0.0428
##	7	0.4204	nan	0.1000	0.0345
##	8	0.3897	nan	0.1000	0.0261
##	9	0.3645	nan	0.1000	0.0261
##	10	0.3418	nan	0.1000	0.0228
##	20	0.2285	nan	0.1000	0.0047
##	40	0.1700	nan	0.1000	0.0007
##	60	0.1468	nan	0.1000	0.0002

```

##      80      0.1351      nan      0.1000      0.0003
##     100      0.1232      nan      0.1000      0.0005
##     120      0.1126      nan      0.1000      0.0001
##     140      0.1019      nan      0.1000      0.0000
##     150      0.0984      nan      0.1000     -0.0002
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1      0.8183      nan      0.1000      0.0702
##      2      0.7563      nan      0.1000      0.0630
##      3      0.7034      nan      0.1000      0.0526
##      4      0.6547      nan      0.1000      0.0473
##      5      0.6160      nan      0.1000      0.0354
##      6      0.5789      nan      0.1000      0.0364
##      7      0.5455      nan      0.1000      0.0308
##      8      0.5177      nan      0.1000      0.0273
##      9      0.4893      nan      0.1000      0.0263
##     10      0.4662      nan      0.1000      0.0231
##     20      0.3247      nan      0.1000      0.0091
##     40      0.2375      nan      0.1000      0.0007
##     60      0.2171      nan      0.1000      0.0005
##     80      0.2069      nan      0.1000      0.0003
##    100      0.2007      nan      0.1000      0.0004
##    120      0.1957      nan      0.1000      0.0001
##    140      0.1920      nan      0.1000      0.0001
##    150      0.1904      nan      0.1000     -0.0000
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1      0.8027      nan      0.1000      0.0876
##      2      0.7297      nan      0.1000      0.0680
##      3      0.6587      nan      0.1000      0.0706
##      4      0.6000      nan      0.1000      0.0557
##      5      0.5511      nan      0.1000      0.0455
##      6      0.5070      nan      0.1000      0.0442
##      7      0.4695      nan      0.1000      0.0400
##      8      0.4345      nan      0.1000      0.0299
##      9      0.4064      nan      0.1000      0.0269
##     10      0.3855      nan      0.1000      0.0204
##     20      0.2558      nan      0.1000      0.0070
##     40      0.1894      nan      0.1000      0.0011
##     60      0.1695      nan      0.1000      0.0004
##     80      0.1564      nan      0.1000      0.0001
##    100      0.1467      nan      0.1000     -0.0000
##    120      0.1373      nan      0.1000     -0.0001
##    140      0.1303      nan      0.1000     -0.0001
##    150      0.1263      nan      0.1000      0.0003
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1      0.7965      nan      0.1000      0.0955
##      2      0.7121      nan      0.1000      0.0885
##      3      0.6366      nan      0.1000      0.0749

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##	4	0.5724	nan	0.1000	0.0603
##	5	0.5183	nan	0.1000	0.0562
##	6	0.4746	nan	0.1000	0.0425
##	7	0.4316	nan	0.1000	0.0406
##	8	0.4008	nan	0.1000	0.0298
##	9	0.3722	nan	0.1000	0.0276
##	10	0.3465	nan	0.1000	0.0224
##	20	0.2176	nan	0.1000	0.0070
##	40	0.1587	nan	0.1000	0.0015
##	60	0.1357	nan	0.1000	0.0004
##	80	0.1218	nan	0.1000	0.0006
##	100	0.1120	nan	0.1000	0.0004
##	120	0.1042	nan	0.1000	-0.0001
##	140	0.0977	nan	0.1000	0.0001
##	150	0.0948	nan	0.1000	0.0001
##					
##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	0.8103	nan	0.1000	0.0762
##	2	0.7410	nan	0.1000	0.0703
##	3	0.6850	nan	0.1000	0.0570
##	4	0.6377	nan	0.1000	0.0479
##	5	0.5959	nan	0.1000	0.0404
##	6	0.5628	nan	0.1000	0.0292
##	7	0.5300	nan	0.1000	0.0323
##	8	0.5041	nan	0.1000	0.0245
##	9	0.4740	nan	0.1000	0.0290
##	10	0.4512	nan	0.1000	0.0231
##	20	0.3142	nan	0.1000	0.0087
##	40	0.2318	nan	0.1000	0.0015
##	60	0.2128	nan	0.1000	0.0002
##	80	0.2029	nan	0.1000	0.0002
##	100	0.1969	nan	0.1000	-0.0005
##	120	0.1927	nan	0.1000	-0.0002
##	140	0.1897	nan	0.1000	0.0001
##	150	0.1886	nan	0.1000	0.0001
##					
##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	0.7929	nan	0.1000	0.1002
##	2	0.7155	nan	0.1000	0.0753
##	3	0.6428	nan	0.1000	0.0665
##	4	0.5853	nan	0.1000	0.0540
##	5	0.5372	nan	0.1000	0.0470
##	6	0.4943	nan	0.1000	0.0402
##	7	0.4602	nan	0.1000	0.0312
##	8	0.4286	nan	0.1000	0.0284
##	9	0.4035	nan	0.1000	0.0252
##	10	0.3793	nan	0.1000	0.0233
##	20	0.2475	nan	0.1000	0.0062
##	40	0.1865	nan	0.1000	0.0015
##	60	0.1671	nan	0.1000	0.0009


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##      80      0.1546      nan      0.1000      0.0002
##     100      0.1481      nan      0.1000     -0.0005
##     120      0.1400      nan      0.1000      0.0001
##     140      0.1316      nan      0.1000      0.0001
##     150      0.1291      nan      0.1000      0.0001
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1      0.7823      nan      0.1000      0.1039
##      2      0.6944      nan      0.1000      0.0831
##      3      0.6179      nan      0.1000      0.0708
##      4      0.5572      nan      0.1000      0.0571
##      5      0.5076      nan      0.1000      0.0471
##      6      0.4635      nan      0.1000      0.0409
##      7      0.4237      nan      0.1000      0.0389
##      8      0.3925      nan      0.1000      0.0312
##      9      0.3635      nan      0.1000      0.0297
##     10      0.3379      nan      0.1000      0.0237
##     20      0.2143      nan      0.1000      0.0062
##     40      0.1577      nan      0.1000      0.0011
##     60      0.1373      nan      0.1000      0.0004
##     80      0.1220      nan      0.1000      0.0004
##    100      0.1111      nan      0.1000      0.0001
##    120      0.1038      nan      0.1000      0.0002
##    140      0.0975      nan      0.1000     -0.0001
##    150      0.0943      nan      0.1000      0.0001
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1      0.8068      nan      0.1000      0.0701
##      2      0.7487      nan      0.1000      0.0601
##      3      0.6975      nan      0.1000      0.0531
##      4      0.6524      nan      0.1000      0.0413
##      5      0.6146      nan      0.1000      0.0373
##      6      0.5818      nan      0.1000      0.0328
##      7      0.5520      nan      0.1000      0.0272
##      8      0.5250      nan      0.1000      0.0279
##      9      0.5016      nan      0.1000      0.0253
##     10      0.4794      nan      0.1000      0.0212
##     20      0.3394      nan      0.1000      0.0072
##     40      0.2515      nan      0.1000      0.0013
##     60      0.2313      nan      0.1000      0.0007
##     80      0.2214      nan      0.1000     -0.0001
##    100      0.2146      nan      0.1000      0.0000
##    120      0.2102      nan      0.1000      0.0002
##    140      0.2066      nan      0.1000     -0.0002
##    150      0.2049      nan      0.1000      0.0001
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1      0.7934      nan      0.1000      0.0828
##      2      0.7205      nan      0.1000      0.0727
##      3      0.6542      nan      0.1000      0.0636

```

##	4	0.5982	nan	0.1000	0.0525
##	5	0.5500	nan	0.1000	0.0439
##	6	0.5070	nan	0.1000	0.0393
##	7	0.4774	nan	0.1000	0.0252
##	8	0.4472	nan	0.1000	0.0306
##	9	0.4213	nan	0.1000	0.0248
##	10	0.3966	nan	0.1000	0.0239
##	20	0.2699	nan	0.1000	0.0056
##	40	0.1977	nan	0.1000	0.0011
##	60	0.1771	nan	0.1000	0.0007
##	80	0.1610	nan	0.1000	0.0004
##	100	0.1529	nan	0.1000	0.0003
##	120	0.1437	nan	0.1000	-0.0002
##	140	0.1356	nan	0.1000	-0.0001
##	150	0.1325	nan	0.1000	0.0000
##					
##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	0.7836	nan	0.1000	0.1004
##	2	0.7021	nan	0.1000	0.0808
##	3	0.6334	nan	0.1000	0.0671
##	4	0.5738	nan	0.1000	0.0592
##	5	0.5238	nan	0.1000	0.0505
##	6	0.4823	nan	0.1000	0.0443
##	7	0.4456	nan	0.1000	0.0364
##	8	0.4123	nan	0.1000	0.0301
##	9	0.3835	nan	0.1000	0.0269
##	10	0.3582	nan	0.1000	0.0234
##	20	0.2373	nan	0.1000	0.0054
##	40	0.1693	nan	0.1000	0.0015
##	60	0.1473	nan	0.1000	0.0002
##	80	0.1323	nan	0.1000	0.0003
##	100	0.1217	nan	0.1000	0.0004
##	120	0.1126	nan	0.1000	0.0002
##	140	0.1051	nan	0.1000	0.0001
##	150	0.1011	nan	0.1000	0.0001
##					
##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	0.7661	nan	0.1000	0.0642
##	2	0.7050	nan	0.1000	0.0581
##	3	0.6562	nan	0.1000	0.0491
##	4	0.6103	nan	0.1000	0.0426
##	5	0.5722	nan	0.1000	0.0365
##	6	0.5417	nan	0.1000	0.0315
##	7	0.5123	nan	0.1000	0.0275
##	8	0.4868	nan	0.1000	0.0252
##	9	0.4628	nan	0.1000	0.0220
##	10	0.4422	nan	0.1000	0.0200
##	20	0.3118	nan	0.1000	0.0086
##	40	0.2307	nan	0.1000	0.0019
##	60	0.2106	nan	0.1000	0.0007

##	80	0.2010	nan	0.1000	0.0003
##	100	0.1945	nan	0.1000	0.0004
##	120	0.1909	nan	0.1000	0.0000
##	140	0.1882	nan	0.1000	0.0001
##	150	0.1868	nan	0.1000	0.0001
##					
##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	0.7544	nan	0.1000	0.0832
##	2	0.6783	nan	0.1000	0.0728
##	3	0.6203	nan	0.1000	0.0588
##	4	0.5643	nan	0.1000	0.0536
##	5	0.5190	nan	0.1000	0.0452
##	6	0.4835	nan	0.1000	0.0357
##	7	0.4485	nan	0.1000	0.0340
##	8	0.4196	nan	0.1000	0.0302
##	9	0.3964	nan	0.1000	0.0238
##	10	0.3702	nan	0.1000	0.0230
##	20	0.2415	nan	0.1000	0.0062
##	40	0.1852	nan	0.1000	0.0007
##	60	0.1630	nan	0.1000	0.0005
##	80	0.1536	nan	0.1000	-0.0001
##	100	0.1445	nan	0.1000	0.0005
##	120	0.1343	nan	0.1000	-0.0001
##	140	0.1270	nan	0.1000	-0.0001
##	150	0.1245	nan	0.1000	-0.0001
##					
##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	0.7401	nan	0.1000	0.0961
##	2	0.6620	nan	0.1000	0.0822
##	3	0.5952	nan	0.1000	0.0635
##	4	0.5386	nan	0.1000	0.0545
##	5	0.4887	nan	0.1000	0.0454
##	6	0.4483	nan	0.1000	0.0390
##	7	0.4158	nan	0.1000	0.0326
##	8	0.3854	nan	0.1000	0.0286
##	9	0.3583	nan	0.1000	0.0225
##	10	0.3320	nan	0.1000	0.0240
##	20	0.2167	nan	0.1000	0.0053
##	40	0.1571	nan	0.1000	0.0014
##	60	0.1399	nan	0.1000	0.0003
##	80	0.1248	nan	0.1000	0.0008
##	100	0.1131	nan	0.1000	0.0005
##	120	0.1050	nan	0.1000	0.0001
##	140	0.0970	nan	0.1000	0.0001
##	150	0.0936	nan	0.1000	0.0006
##					
##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	0.8512	nan	0.1000	0.0834
##	2	0.7818	nan	0.1000	0.0669
##	3	0.7238	nan	0.1000	0.0582

##	4	0.6729	nan	0.1000	0.0464
##	5	0.6292	nan	0.1000	0.0417
##	6	0.5909	nan	0.1000	0.0338
##	7	0.5572	nan	0.1000	0.0335
##	8	0.5283	nan	0.1000	0.0311
##	9	0.5020	nan	0.1000	0.0252
##	10	0.4748	nan	0.1000	0.0271
##	20	0.3285	nan	0.1000	0.0083
##	40	0.2399	nan	0.1000	0.0012
##	60	0.2195	nan	0.1000	0.0003
##	80	0.2091	nan	0.1000	0.0003
##	100	0.2025	nan	0.1000	0.0001
##	120	0.1978	nan	0.1000	-0.0003
##	140	0.1939	nan	0.1000	-0.0003
##	150	0.1925	nan	0.1000	0.0001
##					
##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	0.8387	nan	0.1000	0.0908
##	2	0.7580	nan	0.1000	0.0766
##	3	0.6856	nan	0.1000	0.0683
##	4	0.6247	nan	0.1000	0.0659
##	5	0.5721	nan	0.1000	0.0512
##	6	0.5256	nan	0.1000	0.0450
##	7	0.4848	nan	0.1000	0.0391
##	8	0.4479	nan	0.1000	0.0362
##	9	0.4165	nan	0.1000	0.0320
##	10	0.3906	nan	0.1000	0.0252
##	20	0.2560	nan	0.1000	0.0060
##	40	0.1869	nan	0.1000	0.0013
##	60	0.1637	nan	0.1000	0.0004
##	80	0.1494	nan	0.1000	0.0000
##	100	0.1402	nan	0.1000	0.0004
##	120	0.1323	nan	0.1000	-0.0001
##	140	0.1230	nan	0.1000	0.0001
##	150	0.1208	nan	0.1000	0.0000
##					
##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	0.8204	nan	0.1000	0.1065
##	2	0.7304	nan	0.1000	0.0853
##	3	0.6509	nan	0.1000	0.0802
##	4	0.5864	nan	0.1000	0.0619
##	5	0.5314	nan	0.1000	0.0538
##	6	0.4843	nan	0.1000	0.0464
##	7	0.4450	nan	0.1000	0.0392
##	8	0.4094	nan	0.1000	0.0347
##	9	0.3791	nan	0.1000	0.0295
##	10	0.3524	nan	0.1000	0.0225
##	20	0.2244	nan	0.1000	0.0062
##	40	0.1600	nan	0.1000	0.0011
##	60	0.1376	nan	0.1000	0.0012

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##      80      0.1234      nan      0.1000     -0.0001
##     100      0.1131      nan      0.1000      0.0007
##     120      0.1052      nan      0.1000     -0.0001
##     140      0.0972      nan      0.1000      0.0000
##     150      0.0946      nan      0.1000      0.0002
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1      0.7952      nan      0.1000      0.0726
##      2      0.7346      nan      0.1000      0.0617
##      3      0.6833      nan      0.1000      0.0502
##      4      0.6366      nan      0.1000      0.0476
##      5      0.5962      nan      0.1000      0.0376
##      6      0.5637      nan      0.1000      0.0327
##      7      0.5322      nan      0.1000      0.0303
##      8      0.5046      nan      0.1000      0.0263
##      9      0.4814      nan      0.1000      0.0228
##     10      0.4569      nan      0.1000      0.0230
##     20      0.3225      nan      0.1000      0.0093
##     40      0.2426      nan      0.1000      0.0012
##     60      0.2220      nan      0.1000      0.0006
##     80      0.2121      nan      0.1000      0.0002
##    100      0.2054      nan      0.1000      0.0001
##    120      0.2007      nan      0.1000      0.0002
##    140      0.1975      nan      0.1000     -0.0000
##    150      0.1959      nan      0.1000     -0.0000
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1      0.7767      nan      0.1000      0.0954
##      2      0.7009      nan      0.1000      0.0741
##      3      0.6357      nan      0.1000      0.0619
##      4      0.5825      nan      0.1000      0.0507
##      5      0.5376      nan      0.1000      0.0386
##      6      0.4996      nan      0.1000      0.0370
##      7      0.4645      nan      0.1000      0.0310
##      8      0.4341      nan      0.1000      0.0276
##      9      0.4084      nan      0.1000      0.0256
##     10      0.3860      nan      0.1000      0.0215
##     20      0.2597      nan      0.1000      0.0066
##     40      0.1967      nan      0.1000      0.0007
##     60      0.1755      nan      0.1000      0.0000
##     80      0.1615      nan      0.1000     -0.0003
##    100      0.1546      nan      0.1000     -0.0003
##    120      0.1481      nan      0.1000     -0.0001
##    140      0.1406      nan      0.1000     -0.0001
##    150      0.1365      nan      0.1000     -0.0000
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1      0.7723      nan      0.1000      0.0929
##      2      0.6887      nan      0.1000      0.0844
##      3      0.6177      nan      0.1000      0.0691

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##	4	0.5598	nan	0.1000	0.0589
##	5	0.5104	nan	0.1000	0.0489
##	6	0.4651	nan	0.1000	0.0424
##	7	0.4298	nan	0.1000	0.0334
##	8	0.3979	nan	0.1000	0.0292
##	9	0.3724	nan	0.1000	0.0232
##	10	0.3484	nan	0.1000	0.0247
##	20	0.2265	nan	0.1000	0.0068
##	40	0.1655	nan	0.1000	0.0014
##	60	0.1470	nan	0.1000	-0.0000
##	80	0.1346	nan	0.1000	0.0002
##	100	0.1224	nan	0.1000	0.0000
##	120	0.1132	nan	0.1000	-0.0003
##	140	0.1045	nan	0.1000	0.0000
##	150	0.1021	nan	0.1000	0.0001
##					
##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	0.8017	nan	0.1000	0.0781
##	2	0.7384	nan	0.1000	0.0610
##	3	0.6872	nan	0.1000	0.0513
##	4	0.6429	nan	0.1000	0.0430
##	5	0.6047	nan	0.1000	0.0354
##	6	0.5697	nan	0.1000	0.0329
##	7	0.5408	nan	0.1000	0.0254
##	8	0.5129	nan	0.1000	0.0276
##	9	0.4885	nan	0.1000	0.0230
##	10	0.4667	nan	0.1000	0.0224
##	20	0.3324	nan	0.1000	0.0069
##	40	0.2453	nan	0.1000	0.0019
##	60	0.2240	nan	0.1000	0.0002
##	80	0.2154	nan	0.1000	0.0000
##	100	0.2104	nan	0.1000	-0.0000
##	120	0.2066	nan	0.1000	-0.0005
##	140	0.2032	nan	0.1000	0.0002
##	150	0.2019	nan	0.1000	-0.0001
##					
##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	0.7867	nan	0.1000	0.0854
##	2	0.7117	nan	0.1000	0.0699
##	3	0.6491	nan	0.1000	0.0605
##	4	0.5956	nan	0.1000	0.0515
##	5	0.5472	nan	0.1000	0.0498
##	6	0.5068	nan	0.1000	0.0380
##	7	0.4709	nan	0.1000	0.0352
##	8	0.4411	nan	0.1000	0.0265
##	9	0.4127	nan	0.1000	0.0247
##	10	0.3881	nan	0.1000	0.0239
##	20	0.2565	nan	0.1000	0.0071
##	40	0.1990	nan	0.1000	0.0014
##	60	0.1758	nan	0.1000	0.0007

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##      80      0.1601      nan      0.1000      0.0009
##     100      0.1506      nan      0.1000      0.0001
##     120      0.1439      nan      0.1000      0.0010
##     140      0.1382      nan      0.1000      0.0002
##     150      0.1348      nan      0.1000      0.0001
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1      0.7771      nan      0.1000      0.1034
##      2      0.6912      nan      0.1000      0.0875
##      3      0.6225      nan      0.1000      0.0667
##      4      0.5614      nan      0.1000      0.0608
##      5      0.5104      nan      0.1000      0.0484
##      6      0.4667      nan      0.1000      0.0407
##      7      0.4306      nan      0.1000      0.0360
##      8      0.3989      nan      0.1000      0.0297
##      9      0.3728      nan      0.1000      0.0238
##     10      0.3510      nan      0.1000      0.0207
##     20      0.2299      nan      0.1000      0.0058
##     40      0.1689      nan      0.1000      0.0004
##     60      0.1468      nan      0.1000      0.0006
##     80      0.1341      nan      0.1000     -0.0000
##    100      0.1204      nan      0.1000     -0.0000
##    120      0.1125      nan      0.1000      0.0003
##    140      0.1058      nan      0.1000     -0.0001
##    150      0.1023      nan      0.1000      0.0003
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1      0.8211      nan      0.1000      0.0821
##      2      0.7533      nan      0.1000      0.0679
##      3      0.6951      nan      0.1000      0.0564
##      4      0.6462      nan      0.1000      0.0478
##      5      0.6079      nan      0.1000      0.0347
##      6      0.5665      nan      0.1000      0.0372
##      7      0.5297      nan      0.1000      0.0348
##      8      0.5007      nan      0.1000      0.0262
##      9      0.4766      nan      0.1000      0.0241
##     10      0.4544      nan      0.1000      0.0198
##     20      0.3096      nan      0.1000      0.0081
##     40      0.2254      nan      0.1000      0.0019
##     60      0.2071      nan      0.1000      0.0000
##     80      0.1984      nan      0.1000      0.0004
##    100      0.1931      nan      0.1000     -0.0006
##    120      0.1888      nan      0.1000      0.0001
##    140      0.1860      nan      0.1000      0.0000
##    150      0.1845      nan      0.1000     -0.0000
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1      0.8030      nan      0.1000      0.1002
##      2      0.7238      nan      0.1000      0.0793
##      3      0.6495      nan      0.1000      0.0714

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##	4	0.5889	nan	0.1000	0.0619
##	5	0.5414	nan	0.1000	0.0454
##	6	0.4982	nan	0.1000	0.0422
##	7	0.4590	nan	0.1000	0.0356
##	8	0.4262	nan	0.1000	0.0319
##	9	0.4013	nan	0.1000	0.0240
##	10	0.3760	nan	0.1000	0.0246
##	20	0.2432	nan	0.1000	0.0057
##	40	0.1806	nan	0.1000	0.0009
##	60	0.1606	nan	0.1000	-0.0003
##	80	0.1467	nan	0.1000	-0.0000
##	100	0.1370	nan	0.1000	-0.0003
##	120	0.1286	nan	0.1000	0.0001
##	140	0.1220	nan	0.1000	-0.0001
##	150	0.1202	nan	0.1000	-0.0001
##					
##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	0.7926	nan	0.1000	0.1046
##	2	0.7042	nan	0.1000	0.0883
##	3	0.6283	nan	0.1000	0.0768
##	4	0.5635	nan	0.1000	0.0652
##	5	0.5122	nan	0.1000	0.0489
##	6	0.4672	nan	0.1000	0.0454
##	7	0.4290	nan	0.1000	0.0376
##	8	0.3960	nan	0.1000	0.0329
##	9	0.3672	nan	0.1000	0.0281
##	10	0.3426	nan	0.1000	0.0254
##	20	0.2183	nan	0.1000	0.0059
##	40	0.1546	nan	0.1000	0.0015
##	60	0.1341	nan	0.1000	-0.0001
##	80	0.1189	nan	0.1000	-0.0000
##	100	0.1097	nan	0.1000	-0.0001
##	120	0.1018	nan	0.1000	-0.0001
##	140	0.0952	nan	0.1000	0.0001
##	150	0.0927	nan	0.1000	-0.0000
##					
##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	0.7966	nan	0.1000	0.0708
##	2	0.7333	nan	0.1000	0.0596
##	3	0.6801	nan	0.1000	0.0485
##	4	0.6363	nan	0.1000	0.0475
##	5	0.5969	nan	0.1000	0.0383
##	6	0.5639	nan	0.1000	0.0305
##	7	0.5340	nan	0.1000	0.0289
##	8	0.5080	nan	0.1000	0.0239
##	9	0.4833	nan	0.1000	0.0226
##	10	0.4574	nan	0.1000	0.0249
##	20	0.3235	nan	0.1000	0.0087
##	40	0.2391	nan	0.1000	0.0016
##	60	0.2190	nan	0.1000	0.0002


```

##      80      0.2087      nan      0.1000      0.0001
##     100      0.2012      nan      0.1000     -0.0000
##     120      0.1973      nan      0.1000     -0.0003
##     140      0.1938      nan      0.1000     -0.0001
##     150      0.1923      nan      0.1000     -0.0001
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1      0.7818      nan      0.1000      0.0865
##      2      0.7098      nan      0.1000      0.0716
##      3      0.6409      nan      0.1000      0.0656
##      4      0.5886      nan      0.1000      0.0496
##      5      0.5407      nan      0.1000      0.0475
##      6      0.4984      nan      0.1000      0.0396
##      7      0.4639      nan      0.1000      0.0336
##      8      0.4345      nan      0.1000      0.0301
##      9      0.4072      nan      0.1000      0.0246
##     10      0.3829      nan      0.1000      0.0241
##     20      0.2551      nan      0.1000      0.0057
##     40      0.1924      nan      0.1000      0.0009
##     60      0.1718      nan      0.1000      0.0009
##     80      0.1601      nan      0.1000     -0.0001
##    100      0.1513      nan      0.1000      0.0002
##    120      0.1424      nan      0.1000      0.0003
##    140      0.1361      nan      0.1000     -0.0003
##    150      0.1318      nan      0.1000      0.0005
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1      0.7724      nan      0.1000      0.0960
##      2      0.6885      nan      0.1000      0.0820
##      3      0.6238      nan      0.1000      0.0630
##      4      0.5615      nan      0.1000      0.0623
##      5      0.5095      nan      0.1000      0.0525
##      6      0.4652      nan      0.1000      0.0419
##      7      0.4274      nan      0.1000      0.0363
##      8      0.3931      nan      0.1000      0.0302
##      9      0.3652      nan      0.1000      0.0254
##     10      0.3436      nan      0.1000      0.0208
##     20      0.2252      nan      0.1000      0.0064
##     40      0.1615      nan      0.1000      0.0005
##     60      0.1436      nan      0.1000     -0.0005
##     80      0.1292      nan      0.1000      0.0001
##    100      0.1183      nan      0.1000      0.0004
##    120      0.1097      nan      0.1000      0.0001
##    140      0.1036      nan      0.1000      0.0000
##    150      0.1002      nan      0.1000      0.0001
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1      0.7298      nan      0.1000      0.0691
##      2      0.6726      nan      0.1000      0.0581
##      3      0.6268      nan      0.1000      0.0496

```

##	4	0.5855	nan	0.1000	0.0414
##	5	0.5504	nan	0.1000	0.0348
##	6	0.5209	nan	0.1000	0.0299
##	7	0.4918	nan	0.1000	0.0292
##	8	0.4632	nan	0.1000	0.0245
##	9	0.4426	nan	0.1000	0.0200
##	10	0.4234	nan	0.1000	0.0190
##	20	0.2934	nan	0.1000	0.0088
##	40	0.2106	nan	0.1000	0.0012
##	60	0.1914	nan	0.1000	0.0005
##	80	0.1836	nan	0.1000	-0.0001
##	100	0.1781	nan	0.1000	-0.0002
##	120	0.1749	nan	0.1000	-0.0005
##	140	0.1711	nan	0.1000	0.0000
##	150	0.1695	nan	0.1000	0.0002
##					
##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	0.7220	nan	0.1000	0.0799
##	2	0.6511	nan	0.1000	0.0730
##	3	0.5930	nan	0.1000	0.0532
##	4	0.5393	nan	0.1000	0.0514
##	5	0.4959	nan	0.1000	0.0431
##	6	0.4582	nan	0.1000	0.0359
##	7	0.4272	nan	0.1000	0.0290
##	8	0.3998	nan	0.1000	0.0264
##	9	0.3754	nan	0.1000	0.0230
##	10	0.3515	nan	0.1000	0.0227
##	20	0.2251	nan	0.1000	0.0065
##	40	0.1687	nan	0.1000	0.0013
##	60	0.1516	nan	0.1000	-0.0001
##	80	0.1421	nan	0.1000	0.0003
##	100	0.1343	nan	0.1000	0.0001
##	120	0.1261	nan	0.1000	0.0004
##	140	0.1190	nan	0.1000	0.0002
##	150	0.1161	nan	0.1000	0.0000
##					
##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	0.7077	nan	0.1000	0.0945
##	2	0.6317	nan	0.1000	0.0788
##	3	0.5659	nan	0.1000	0.0598
##	4	0.5135	nan	0.1000	0.0532
##	5	0.4651	nan	0.1000	0.0450
##	6	0.4261	nan	0.1000	0.0361
##	7	0.3898	nan	0.1000	0.0347
##	8	0.3586	nan	0.1000	0.0313
##	9	0.3327	nan	0.1000	0.0251
##	10	0.3080	nan	0.1000	0.0236
##	20	0.1996	nan	0.1000	0.0038
##	40	0.1419	nan	0.1000	0.0006
##	60	0.1232	nan	0.1000	0.0003

```

##      80      0.1123      nan      0.1000      0.0007
##     100      0.1050      nan      0.1000     -0.0002
##     120      0.0978      nan      0.1000     -0.0003
##     140      0.0916      nan      0.1000     -0.0002
##     150      0.0890      nan      0.1000     -0.0000
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1      0.8283      nan      0.1000      0.0804
##      2      0.7598      nan      0.1000      0.0702
##      3      0.7036      nan      0.1000      0.0547
##      4      0.6527      nan      0.1000      0.0476
##      5      0.6121      nan      0.1000      0.0408
##      6      0.5741      nan      0.1000      0.0368
##      7      0.5439      nan      0.1000      0.0306
##      8      0.5156      nan      0.1000      0.0279
##      9      0.4895      nan      0.1000      0.0240
##     10      0.4674      nan      0.1000      0.0183
##     20      0.3260      nan      0.1000      0.0079
##     40      0.2420      nan      0.1000      0.0014
##     60      0.2204      nan      0.1000      0.0003
##     80      0.2098      nan      0.1000      0.0005
##    100      0.2023      nan      0.1000      0.0001
##    120      0.1979      nan      0.1000      0.0001
##    140      0.1938      nan      0.1000     -0.0003
##    150      0.1927      nan      0.1000     -0.0001
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1      0.8186      nan      0.1000      0.0969
##      2      0.7351      nan      0.1000      0.0800
##      3      0.6672      nan      0.1000      0.0644
##      4      0.6102      nan      0.1000      0.0549
##      5      0.5588      nan      0.1000      0.0539
##      6      0.5148      nan      0.1000      0.0435
##      7      0.4762      nan      0.1000      0.0399
##      8      0.4464      nan      0.1000      0.0293
##      9      0.4190      nan      0.1000      0.0248
##     10      0.3944      nan      0.1000      0.0248
##     20      0.2626      nan      0.1000      0.0060
##     40      0.1947      nan      0.1000      0.0010
##     60      0.1693      nan      0.1000      0.0008
##     80      0.1555      nan      0.1000      0.0001
##    100      0.1456      nan      0.1000      0.0001
##    120      0.1366      nan      0.1000      0.0001
##    140      0.1301      nan      0.1000     -0.0002
##    150      0.1274      nan      0.1000      0.0002
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1      0.8062      nan      0.1000      0.1036
##      2      0.7141      nan      0.1000      0.0917
##      3      0.6397      nan      0.1000      0.0741

```

##	4	0.5790	nan	0.1000	0.0599
##	5	0.5239	nan	0.1000	0.0492
##	6	0.4784	nan	0.1000	0.0425
##	7	0.4391	nan	0.1000	0.0386
##	8	0.4059	nan	0.1000	0.0316
##	9	0.3799	nan	0.1000	0.0270
##	10	0.3543	nan	0.1000	0.0234
##	20	0.2268	nan	0.1000	0.0052
##	40	0.1655	nan	0.1000	0.0012
##	60	0.1446	nan	0.1000	0.0006
##	80	0.1290	nan	0.1000	-0.0003
##	100	0.1165	nan	0.1000	-0.0002
##	120	0.1078	nan	0.1000	-0.0001
##	140	0.0993	nan	0.1000	-0.0001
##	150	0.0956	nan	0.1000	0.0002
##					
##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	0.7649	nan	0.1000	0.0749
##	2	0.7055	nan	0.1000	0.0586
##	3	0.6533	nan	0.1000	0.0493
##	4	0.6095	nan	0.1000	0.0421
##	5	0.5724	nan	0.1000	0.0343
##	6	0.5419	nan	0.1000	0.0314
##	7	0.5152	nan	0.1000	0.0268
##	8	0.4880	nan	0.1000	0.0253
##	9	0.4628	nan	0.1000	0.0246
##	10	0.4427	nan	0.1000	0.0197
##	20	0.3094	nan	0.1000	0.0063
##	40	0.2315	nan	0.1000	-0.0008
##	60	0.2126	nan	0.1000	0.0003
##	80	0.2035	nan	0.1000	0.0005
##	100	0.1976	nan	0.1000	0.0002
##	120	0.1936	nan	0.1000	0.0001
##	140	0.1906	nan	0.1000	-0.0001
##	150	0.1894	nan	0.1000	0.0001
##					
##	Iter	TrainDeviance	ValidDeviance	StepSize	Improve
##	1	0.7510	nan	0.1000	0.0846
##	2	0.6778	nan	0.1000	0.0741
##	3	0.6171	nan	0.1000	0.0601
##	4	0.5629	nan	0.1000	0.0541
##	5	0.5166	nan	0.1000	0.0456
##	6	0.4778	nan	0.1000	0.0372
##	7	0.4427	nan	0.1000	0.0352
##	8	0.4143	nan	0.1000	0.0239
##	9	0.3879	nan	0.1000	0.0231
##	10	0.3667	nan	0.1000	0.0197
##	20	0.2422	nan	0.1000	0.0062
##	40	0.1840	nan	0.1000	0.0016
##	60	0.1637	nan	0.1000	0.0006

```
##      80      0.1495      nan      0.1000      0.0000
##     100      0.1413      nan      0.1000      0.0002
##     120      0.1346      nan      0.1000     -0.0001
##     140      0.1291      nan      0.1000     -0.0000
##     150      0.1257      nan      0.1000      0.0001
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1      0.7422      nan      0.1000      0.0940
##      2      0.6588      nan      0.1000      0.0815
##      3      0.5927      nan      0.1000      0.0622
##      4      0.5330      nan      0.1000      0.0592
##      5      0.4844      nan      0.1000      0.0487
##      6      0.4449      nan      0.1000      0.0377
##      7      0.4100      nan      0.1000      0.0314
##      8      0.3799      nan      0.1000      0.0277
##      9      0.3524      nan      0.1000      0.0243
##     10      0.3313      nan      0.1000      0.0210
##     20      0.2209      nan      0.1000      0.0033
##     40      0.1626      nan      0.1000      0.0018
##     60      0.1402      nan      0.1000      0.0000
##     80      0.1258      nan      0.1000      0.0004
##    100      0.1133      nan      0.1000      0.0000
##    120      0.1046      nan      0.1000      0.0001
##    140      0.0992      nan      0.1000     -0.0000
##    150      0.0945      nan      0.1000      0.0004
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1      0.7851      nan      0.1000      0.1010
##      2      0.7025      nan      0.1000      0.0738
##      3      0.6308      nan      0.1000      0.0717
##      4      0.5688      nan      0.1000      0.0579
##      5      0.5146      nan      0.1000      0.0520
##      6      0.4658      nan      0.1000      0.0499
##      7      0.4279      nan      0.1000      0.0372
##      8      0.3947      nan      0.1000      0.0293
##      9      0.3688      nan      0.1000      0.0272
##     10      0.3441      nan      0.1000      0.0226
##     20      0.2257      nan      0.1000      0.0051
##     40      0.1726      nan      0.1000      0.0003
##     60      0.1518      nan      0.1000      0.0001
##     80      0.1396      nan      0.1000      0.0001
##    100      0.1294      nan      0.1000      0.0002
##    120      0.1200      nan      0.1000      0.0002
##    140      0.1126      nan      0.1000      0.0000
##    150      0.1089      nan      0.1000      0.0002
```

```
# Make predictions on the test set
y_pred_gbm <- predict(model_gbm, X_test)
```

```
# Evaluate the model using mean squared error
```

```
mse_gbm <- mean((y_test - y_pred_gbm)^2)
```

```
# Calculate R-squared
```

```
r2_gbm <- cor(y_pred_gbm, y_test)^2
```

Create and fit the XGBoost model

```
model_xgb <- train(X_train, y_train, method = "xgbTree")
```

```
## [19:32:06] WARNING: src/c_api/c_api.cc:935: `ntree_limit` is deprecated,  
use `iteration_range` instead.
```

```
## [19:32:06] WARNING: src/c_api/c_api.cc:935: `ntree_limit` is deprecated,
use `iteration range` instead.
```

```
## [19:32:06] WARNING: src/c_api/c_api.cc:935: `ntree_limit` is deprecated,  
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```

```
## [19:32:06] WARNING: src/c_api/c_api.cc:935: `ntree_limit` is deprecated,  
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```

```
## [19:32:06] WARNING: src/c_api/c_api.cc:935: `ntree_limit` is deprecated,  
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```

```
## [19:32:06] WARNING: src/c_api/c_api.cc:935: `ntree_limit` is deprecated,  
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```

```
## [19:32:06] WARNING: src/c_api/c_api.cc:935: `ntree_limit` is deprecated,  
use `iteration range` instead.
```

```
## [19:32:06] WARNING: src/c_api/c_api.cc:935: `ntree_limit` is deprecated,  
use `iteration range` instead.
```

```
## [19:32:07] WARNING: src/c_api/c_api.cc:935: `ntree_limit` is deprecated,  
use `iteration range` instead.
```

```
## [19:32:07] WARNING: src/c_api/c_api.cc:935: `ntree_limit` is deprecated,  
use `iteration range` instead.
```

```
## [19:32:07] WARNING: src/c_api/c_api.cc:935: `ntree_limit` is deprecated,  
use `iteration range` instead.
```

```
## [19:32:07] WARNING: src/c_api/c_api.cc:935: `ntree_limit` is deprecated,  
use `iteration range` instead.
```

```
## [19:32:07] WARNING: src/c_api/c_api.cc:935: `ntree_limit` is deprecated,  
use `iteration range` instead.
```

```
## [19:32:07] WARNING: src/c_api/c_api.cc:935: `ntree_limit` is deprecated,  
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```

```
## [19:32:07] WARNING: src/c_api/c_api.cc:935: `ntree_limit` is deprecated,  
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```

```
## [19:32:07] WARNING: src/c_api/c_api.cc:935: `ntree_limit` is deprecated,  
use `iteration range` instead.
```

```
## [19:32:07] WARNING: src/c_api/c_api.cc:935: `ntree_limit` is deprecated,  
use `iteration range` instead.
```

```
## [19:32:07] WARNING: src/c_api/c_api.cc:935: `ntree_limit` is deprecated,  
use `iteration range` instead.
```

```
## [19:32:07] WARNING: src/c_api/c_api.cc:935: `ntree_limit` is deprecated,  
use `iteration range` instead.
```

```
## [19:32:07] WARNING: src/c_api/c_api.cc:935: `ntree_limit` is deprecated,  
use `iteration range` instead.
```

```
## [19:32:07] WARNING: src/c_api/c_api.cc:935: `ntree_limit` is deprecated,  
use `iteration range` instead.
```

[illegible]

[illegible]

[illegible]

[illegible]

```
## [19:32:16] WARNING: src/c_api/c_api.cc:935: `ntree_limit` is deprecated,  
use `iteration_range` instead.  
## [19:32:16] WARNING: src/c_api/c_api.cc:935: `ntree_limit` is deprecated,  
use `iteration_range` instead.  
## [19:32:16] WARNING: src/c_api/c_api.cc:935: `ntree_limit` is deprecated,  
use `iteration_range` instead.  
## [19:32:16] WARNING: src/c_api/c_api.cc:935: `ntree_limit` is deprecated,  
use `iteration_range` instead.  
## [19:32:16] WARNING: src/c_api/c_api.cc:935: `ntree_limit` is deprecated,  
use `iteration_range` instead.  
## [19:32:16] WARNING: src/c_api/c_api.cc:935: `ntree_limit` is deprecated,  
use `iteration_range` instead.  
## [19:32:17] WARNING: src/c_api/c_api.cc:935: `ntree_limit` is deprecated,  
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## [19:32:17] WARNING: src/c_api/c_api.cc:935: `ntree_limit` is deprecated,  
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## [19:32:17] WARNING: src/c_api/c_api.cc:935: `ntree_limit` is deprecated,  
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## [19:32:17] WARNING: src/c_api/c_api.cc:935: `ntree_limit` is deprecated,  
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## [19:32:17] WARNING: src/c_api/c_api.cc:935: `ntree_limit` is deprecated,  
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## [19:32:17] WARNING: src/c_api/c_api.cc:935: `ntree_limit` is deprecated,  
use `iteration_range` instead.  
## [19:32:18] WARNING: src/c_api/c_api.cc:935: `ntree_limit` is deprecated,  
use `iteration_range` instead.  
## [19:32:18] WARNING: src/c_api/c_api.cc:935: `ntree_limit` is deprecated,  
use `iteration_range` instead.  
## [19:32:18] WARNING: src/c_api/c_api.cc:935: `ntree_limit` is deprecated,  
use `iteration_range` instead.  
## [19:32:18] WARNING: src/c_api/c_api.cc:935: `ntree_limit` is deprecated,  
use `iteration_range` instead.
```

[illegible]

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[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

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[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

```
## [19:33:15] WARNING: src/c_api/c_api.cc:935: `ntree_limit` is deprecated,  
use `iteration_range` instead.  
## [19:33:15] WARNING: src/c_api/c_api.cc:935: `ntree_limit` is deprecated,  
use `iteration_range` instead.  
## [19:33:15] WARNING: src/c_api/c_api.cc:935: `ntree_limit` is deprecated,  
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## [19:33:16] WARNING: src/c_api/c_api.cc:935: `ntree_limit` is deprecated,  
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## [19:33:16] WARNING: src/c_api/c_api.cc:935: `ntree_limit` is deprecated,  
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## [19:33:16] WARNING: src/c_api/c_api.cc:935: `ntree_limit` is deprecated,  
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## [19:33:16] WARNING: src/c_api/c_api.cc:935: `ntree_limit` is deprecated,  
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## [19:33:16] WARNING: src/c_api/c_api.cc:935: `ntree_limit` is deprecated,  
use `iteration_range` instead.  
## [19:33:16] WARNING: src/c_api/c_api.cc:935: `ntree_limit` is deprecated,  
use `iteration_range` instead.  
## [19:33:17] WARNING: src/c_api/c_api.cc:935: `ntree_limit` is deprecated,  
use `iteration_range` instead.  
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```

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```

```
# Make predictions on the test set
```

```
y_pred_xgb <- predict(model_xgb, X_test)
```

```
# Evaluate the model using mean squared error
```

```
mse_xgb <- mean((y_test - y_pred_xgb)^2)
```

```
# Calculate R-squared
```

```
r2_xgb <- cor(y_pred_xgb, y_test)^2
```

```
# Create and fit the SVM model
```

```
model_svm <- train(X_train, y_train, method = "svmRadial")
```

```
# Make predictions on the test set
```

```
y_pred_svm <- predict(model_svm, X_test)
```

```
# Evaluate the model using mean squared error
```

```
mse_svm <- mean((y_test - y_pred_svm)^2)
```

```
# Calculate R-squared
```

```
r2_svm <- cor(y_pred_xgb, y_test)^2
```

```
#create table to compare models
```

```
metrics_df <- data.frame(Model = c("Linear Regression", "Decision Tree",  
"GBM", "XGBoost", "SVM"),
```

```
RMSE = c(mse_LR, mse_tree, mse_gbm, mse_xgb,  
mse_svm),
```

```
R_squared = c(r2_LR, r2_tree, r2_gbm, r2_xgb,  
r2_svm))
```

```
# Print the table
```

```
print(metrics_df)
```

```
##           Model      RMSE R_squared
## 1 Linear Regression 0.4262095 0.5214246
## 2   Decision Tree 0.4370168 0.5092996
## 3             GBM 0.1665639 0.8139392
## 4         XGBoost 0.1159076 0.8703444
## 5             SVM 0.2509491 0.8703444
```

#printing feature table for linear regression model

```
feature_importance_LR <- varImp(model_LR)
print(feature_importance_LR)
```

lm variable importance

##

	Overall
## immunazation	100.000
## literacy_rate	28.309
## domestic_health_expenditure	17.010
## GDP_per_capita	14.246
## education_expenditure	11.466
## water_invest	7.259
## health_expenditure	4.347
## water_productivity	3.676
## health_expenditure_per	0.000

#printing feature table for decision tree model

```
feature_importance_tree <- varImp(model_tree)
print(feature_importance_tree)
```

rpart variable importance

##

	Overall
## GDP_per_capita	100.000
## health_expenditure	85.066
## immunazation	74.809
## domestic_health_expenditure	17.300
## health_expenditure_per	15.521
## water_invest	10.045
## literacy_rate	9.464
## water_productivity	0.000
## education_expenditure	0.000

#printing feature table for gradient boost model

```
feature_importance_gbm <- varImp(model_gbm)
print(feature_importance_gbm)
```

gbm variable importance

##

	Overall
## health_expenditure	100.000
## GDP_per_capita	50.399
## immunazation	47.966
## domestic_health_expenditure	6.493
## water_productivity	5.509
## health_expenditure_per	3.604
## water_invest	2.270
## literacy_rate	2.095
## education_expenditure	0.000

```
#printing feature table for XGBoost model
feature_importance_xgb <- varImp(model_xgb)
print(feature_importance_xgb)
```

```
## xgbTree variable importance
##
##
## Overall
## GDP_per_capita 100.000
## health_expenditure 59.749
## immunazation 53.809
## water_productivity 11.570
## domestic_health_expenditure 10.071
## health_expenditure_per 8.821
## water_invest 6.242
## literacy_rate 4.555
## education_expenditure 0.000
```

```
#printing feature table for SVM model
feature_importance_svm <- varImp(model_svm)
print(feature_importance_svm)
```

```
## loess r-squared variable importance
##
##
## Overall
## health_expenditure 100.000
## GDP_per_capita 97.337
## immunazation 74.854
## domestic_health_expenditure 23.158
## water_invest 16.408
## health_expenditure_per 15.249
## literacy_rate 13.271
## water_productivity 3.007
## education_expenditure 0.000
```