Logistic Regression

In the logistic regression, a regression curve, y = f (x), is fitted. In the regression curve equation, y is a categorical variable. This Regression Model is used for predicting that y has given a set of predictors x. Therefore, predictors can be categorical, continuous, or a mixture of both.

The logistic regression is a classification algorithm that falls under nonlinear regression. This model is used to predict a given binary result (1/0, yes/no, true/false) as a set of independent variables. Furthermore, it helps to represent categorical/binary outcomes using dummy variables.

Logistic regression is a regression model in which the response variable has categorical values such as true/false or 0/1. Therefore, we can measure the probability of the binary response

In [1]:

```
library(tidyverse)
library(extrafont)
library(extrafontdb)
```

```
Warning message:
"package 'tidyverse' was built under R version 3.6.3"-- Attaching packages --------------
------------------------------------------------------------------ tidyverse 1.3.0 --
v ggplot2 3.3.2     v purrr   0.3.4
v tibble  3.0.4     v dplyr   1.0.2
v tidyr   1.1.2     v stringr 1.4.0
v readr   1.3.1     v forcats 0.4.0
Warning message:
"package 'ggplot2' was built under R version 3.6.3"Warning message:
"package 'tibble' was built under R version 3.6.3"Warning message:
"package 'tidyr' was built under R version 3.6.3"Warning message:
"package 'purrr' was built under R version 3.6.3"Warning message:
"package 'dplyr' was built under R version 3.6.3"-- Conflicts --------------------------
--------------------------------------------------------- tidyverse_conflicts() --
x dplyr::filter() masks stats::filter()
x dplyr::lag()    masks stats::lag()
Warning message:
"package 'extrafont' was built under R version 3.6.2"Registering fonts with R
```

In [2]:

```
titanic_data <- read_csv("titanic.csv")
head(titanic_data)
```

```
Parsed with column specification:
cols(
  Survived = col_double(),
  Pclass = col_double(),
  Name = col_character(),
  Sex = col_character(),
  Age = col_double(),
  `Siblings/Spouses Aboard` = col_double(),
  `Parents/Children Aboard` = col_double(),
  Fare = col_double()
)
```

Survived	Pclass	Name	Sex	Age	Siblings/Spouses Aboard	Parents/Children Aboard	Fare
0	3	Mr. Owen Harris Braund	male	22	1	0	7.2500
1	1	Mrs. John Bradley (Florence Briggs Thayer) Cumings	female	38	1	0	71.2833
1	3	Miss. Laina Heikkinen	female	26	0	0	7.9250
1	1	Mrs. Jacques Heath (Lily May Peel) Futrelle	female	35	1	0	53.1000
0	3	Mr. William Henry Allen	male	35	0	0	8.0500

Survived	Pclass	Name	Sex	Age	Siblings/Spouses Aboard	Parents/Children Aboard	Fare
0	3	Mr. James Moran	male	27	0	0	8.4583

In [3]:

```
str(titanic_data)
```

```
tibble [887 x 8] (S3: spec_tbl_df/tbl_df/tbl/data.frame)
 $ Survived               : num [1:887] 0 1 1 1 0 0 0 0 1 1 ...
 $ Pclass                 : num [1:887] 3 1 3 1 3 3 1 3 3 2 ...
 $ Name                   : chr [1:887] "Mr. Owen Harris Braund" "Mrs. John Bradley (Flor
ence Briggs Thayer) Cumings" "Miss. Laina Heikkinen" "Mrs. Jacques Heath (Lily May Peel)
Futrelle" ...
 $ Sex                    : chr [1:887] "male" "female" "female" "female" ...
 $ Age                    : num [1:887] 22 38 26 35 35 27 54 2 27 14 ...
 $ Siblings/Spouses Aboard: num [1:887] 1 1 0 1 0 0 0 3 0 1 ...
 $ Parents/Children Aboard: num [1:887] 0 0 0 0 0 0 0 1 2 0 ...
 $ Fare                   : num [1:887] 7.25 71.28 7.92 53.1 8.05 ...
 - attr(*, "spec")=
  .. cols(
  ..   Survived = col_double(),
  ..   Pclass = col_double(),
  ..   Name = col_character(),
  ..   Sex = col_character(),
  ..   Age = col_double(),
  ..   `Siblings/Spouses Aboard` = col_double(),
  ..   `Parents/Children Aboard` = col_double(),
  ..   Fare = col_double()
  .. )
```

In [27]:

```
titanic_data <- titanic_data %>%
  mutate(Survived = factor(Survived, levels = c(0, 1), labels = c("Died", "Survived")),
         Sex = factor(Sex),
         Pclass = factor(Pclass))

head(titanic_data)
```

Survived	Pclass	Name	Sex	Age	Siblings/Spouses Aboard	Parents/Children Aboard	Fare
Died	3	Mr. Owen Harris Braund	male	22	1	0	7.2500
Survived	1	Mrs. John Bradley (Florence Briggs Thayer) Cumings	female	38	1	0	71.2833
Survived	3	Miss. Laina Heikkinen	female	26	0	0	7.9250
Survived	1	Mrs. Jacques Heath (Lily May Peel) Futrelle	female	35	1	0	53.1000
Died	3	Mr. William Henry Allen	male	35	0	0	8.0500
Died	3	Mr. James Moran	male	27	0	0	8.4583

In [28]:

```
summary(titanic_data)
```

```
     Survived    Pclass       Name                Sex           Age       
 Died    :545   1:216   Length:887         female:314   Min.   : 0.42  
 Survived:342   2:184   Class :character   male  :573   1st Qu.:20.25  
                3:487   Mode  :character                Median :28.00  
                                                        Mean   :29.47  
                                                        3rd Qu.:38.00  
                                                        Max.   :80.00  
 Siblings/Spouses Aboard Parents/Children Aboard      Fare        
 Min.   :0.0000          Min.   :0.0000          Min.   :  0.000  
 1st Qu.:0.0000          1st Qu.:0.0000          1st Qu.:  7.925  
 Median :0.0000          Median :0.0000          Median : 14.454  
 Mean   :0.5254          Mean   :0.3833          Mean   : 32.305  
 3rd Qu.:1.0000          3rd Qu.:0.0000          3rd Qu.: 31.137  
 Max.   :8.0000          Max.   :6.0000          Max.   :512.329  
```

In [29]:

```
str(titanic_data)
```

```
tibble [887 x 8] (S3: spec_tbl_df/tbl_df/tbl/data.frame)
 $ Survived               : Factor w/ 2 levels "Died","Survived": 1 2 2 2 1 1 1 1 2 2 ..
.
 $ Pclass                 : Factor w/ 3 levels "1","2","3": 3 1 3 1 3 3 1 3 3 2 ...
 $ Name                   : chr [1:887] "Mr. Owen Harris Braund" "Mrs. John Bradley (Flor
ence Briggs Thayer) Cumings" "Miss. Laina Heikkinen" "Mrs. Jacques Heath (Lily May Peel)
Futrelle" ...
 $ Sex                    : Factor w/ 2 levels "female","male": 2 1 1 1 2 2 2 2 1 1 ...
 $ Age                    : num [1:887] 22 38 26 35 35 27 54 2 27 14 ...
 $ Siblings/Spouses Aboard: num [1:887] 1 1 0 1 0 0 0 3 0 1 ...
 $ Parents/Children Aboard: num [1:887] 0 0 0 0 0 0 0 1 2 0 ...
 $ Fare                   : num [1:887] 7.25 71.28 7.92 53.1 8.05 ...
 - attr(*, "spec")=
  .. cols(
  ..   Survived = col_double(),
  ..   Pclass = col_double(),
  ..   Name = col_character(),
  ..   Sex = col_character(),
  ..   Age = col_double(),
  ..   `Siblings/Spouses Aboard` = col_double(),
  ..   `Parents/Children Aboard` = col_double(),
  ..   Fare = col_double()
  .. )
```

In [30]:

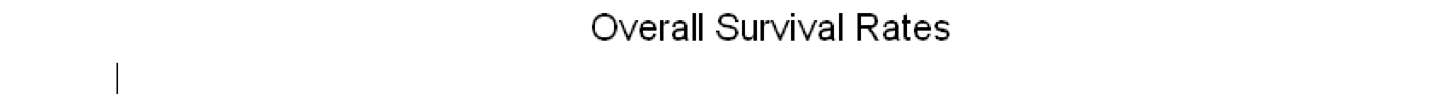
```
table(titanic_data$Survived)
```

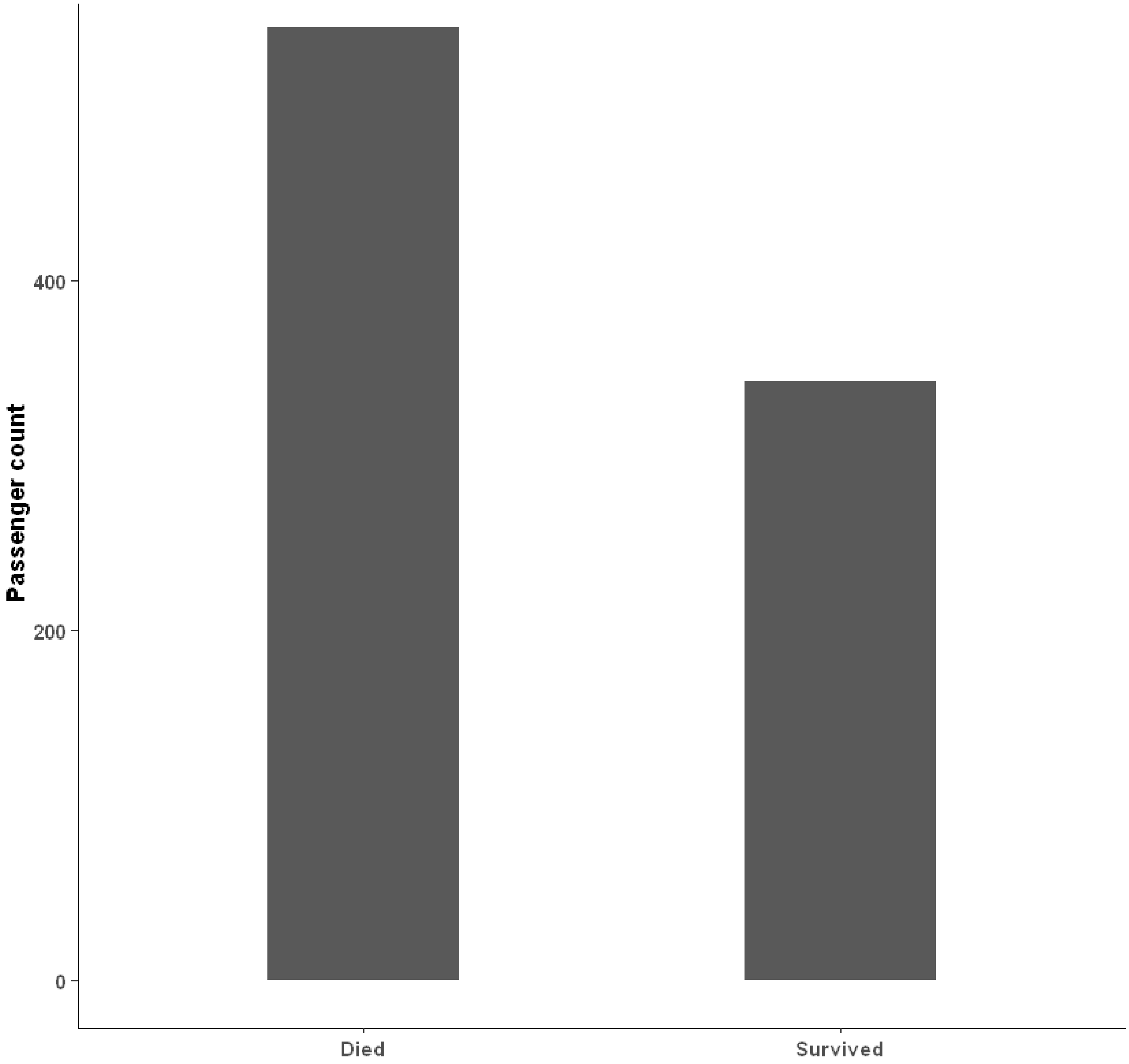
```
    Died Survived 
     545      342 
```

In [31]:

```
titanic_data %>%
  ggplot(aes(x = Survived)) +
  geom_bar(width = 0.4) +
  theme_classic() +
  theme(
    plot.title = element_text(family = "Times New Roman", hjust = 0.5),
    axis.text = element_text(family = "Times New Roman",face = "bold"),
    axis.title = element_text(family = "Times New Roman", face = "bold")
  ) +
  labs(title = "Overall Survival Rates", x = NULL, y = "Passenger count")
```

```
Warning message in grid.Call(C_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call(C_textBounds
, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call(C_textBounds
, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call(C_textBounds
, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call(C_textBounds
, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call(C_textBounds
, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call(C_textBounds
, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call.graphics(C_t
ext, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call(C_textBounds
, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"
```



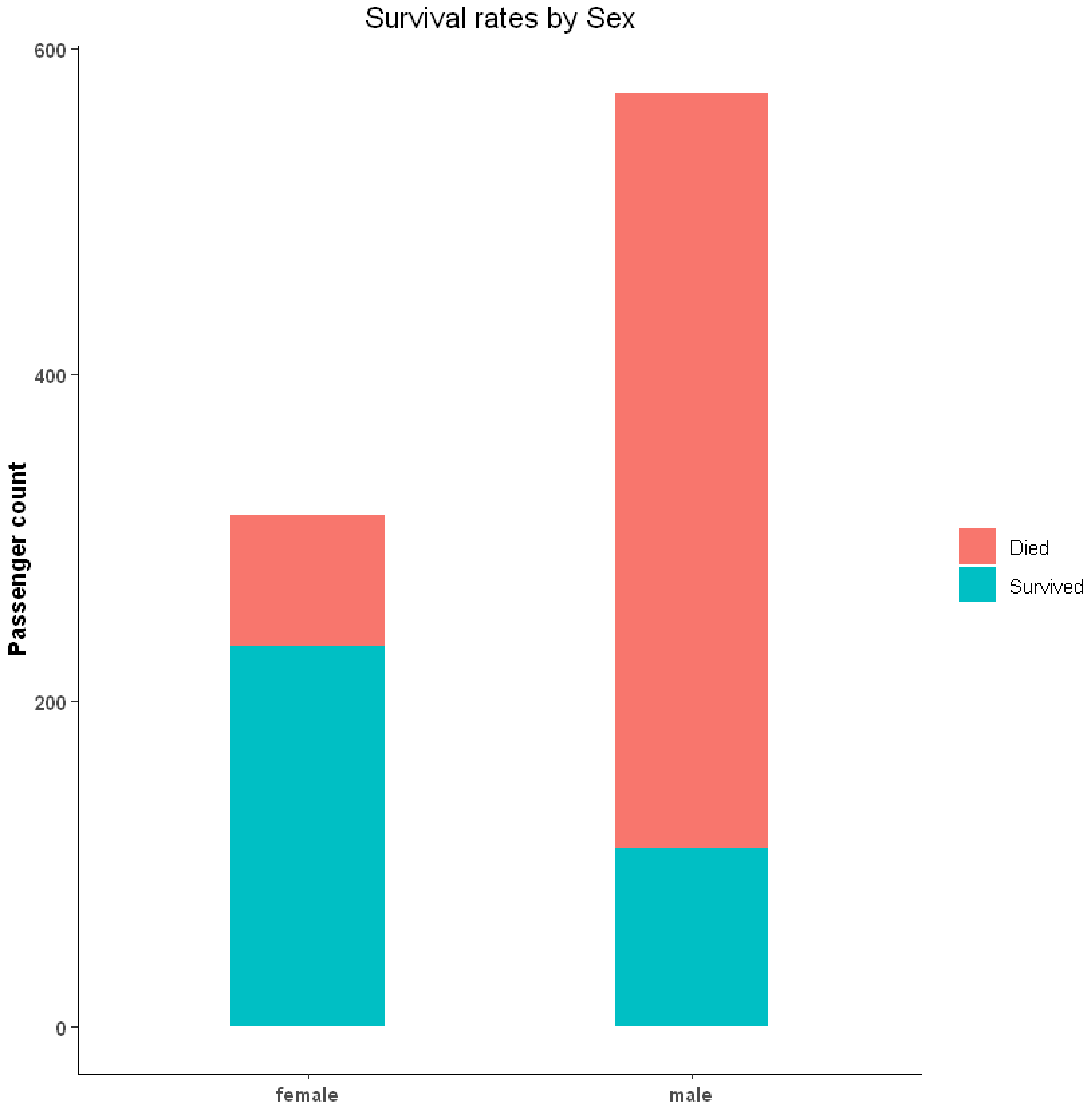


In [32]:

```
titanic_data %>%
  ggplot(aes(x = Sex, fill = Survived)) +
  geom_bar(width = 0.4) +
  theme_classic() +
  theme(
    plot.title = element_text(family = "Times New Roman", hjust = 0.5),
    axis.text = element_text(family = "Times New Roman",face = "bold"),
    axis.title = element_text(family = "Times New Roman", face = "bold"),
    legend.title = element_blank(),
    legend.text = element_text(family = "Times New Roman")

  ) +
  labs(title = "Survival rates by Sex", x = NULL, y = "Passenger count")
```

```
Warning message in grid.Call(C_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call(C_textBounds
, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call(C_textBounds
, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call(C_textBounds
, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call(C_textBounds
, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call(C_textBounds
, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call(C_textBounds
, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call(C_textBounds
, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call.graphics(C_t
ext, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call(C_textBounds
, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call(C_textBounds
, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"
```

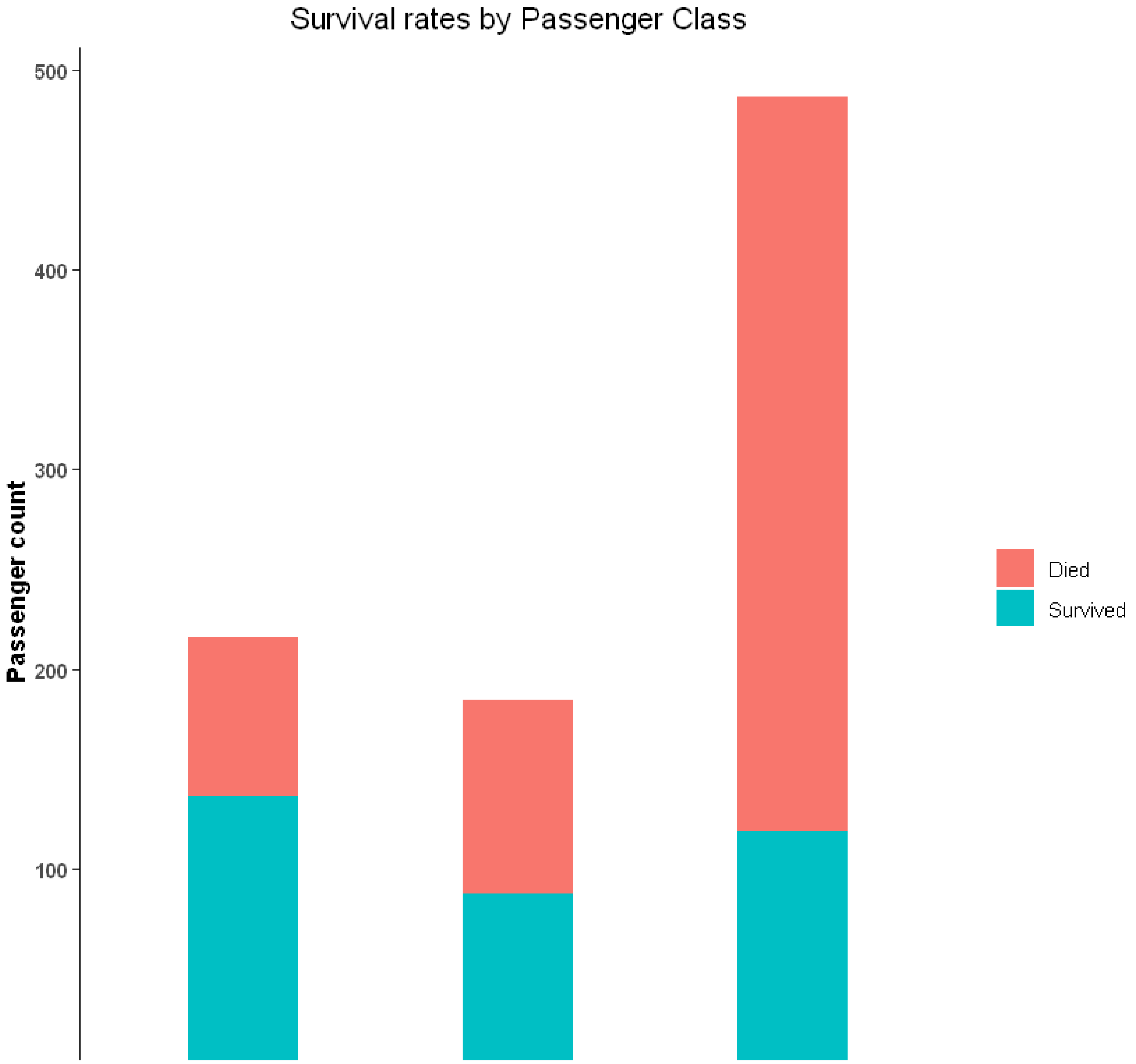


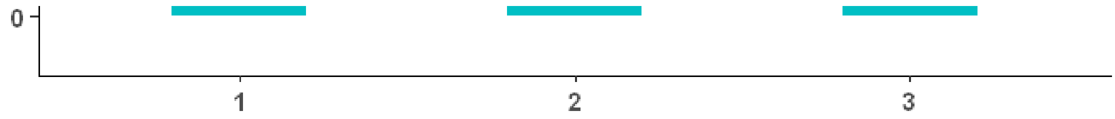
In [33]:

```
titanic_data %>%
  ggplot(aes(x = Pclass, fill = Survived)) +
  geom_bar(width = 0.4) +
  theme_classic() +
  theme(
    plot.title = element_text(family = "Times New Roman", hjust = 0.5),
    axis.text = element_text(family = "Times New Roman",face = "bold"),
    axis.title = element_text(family = "Times New Roman", face = "bold"),
    legend.title = element_blank(),
    legend.text = element_text(family = "Times New Roman")

  ) +
  labs(title = "Survival rates by Passenger Class", x = NULL, y = "Passenger count")
```

```
Warning message in grid.Call(C_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call(C_textBounds
, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call(C_textBounds
, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call(C_textBounds
, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call(C_textBounds
, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call(C_textBounds
, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call(C_textBounds
, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call(C_textBounds
, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call.graphics(C_t
ext, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call(C_textBounds
, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call(C_textBounds
, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"
```



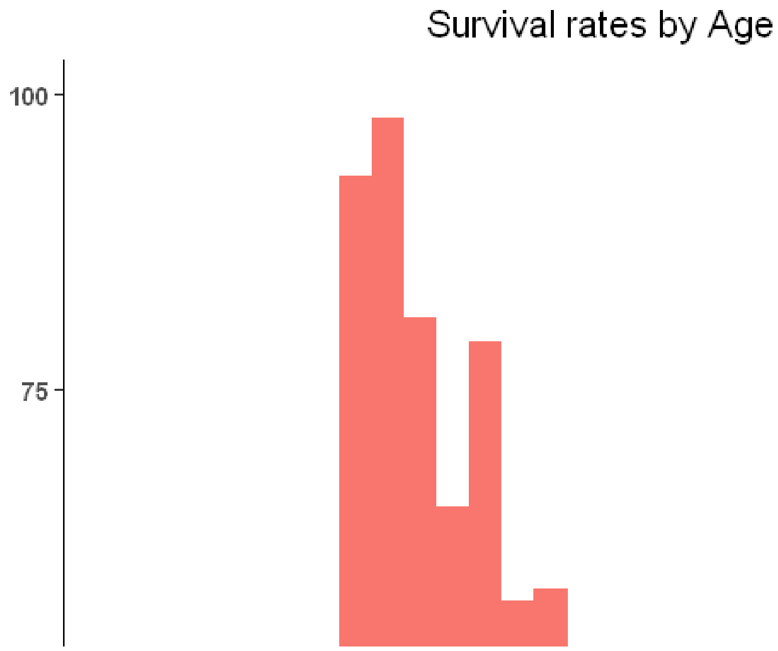


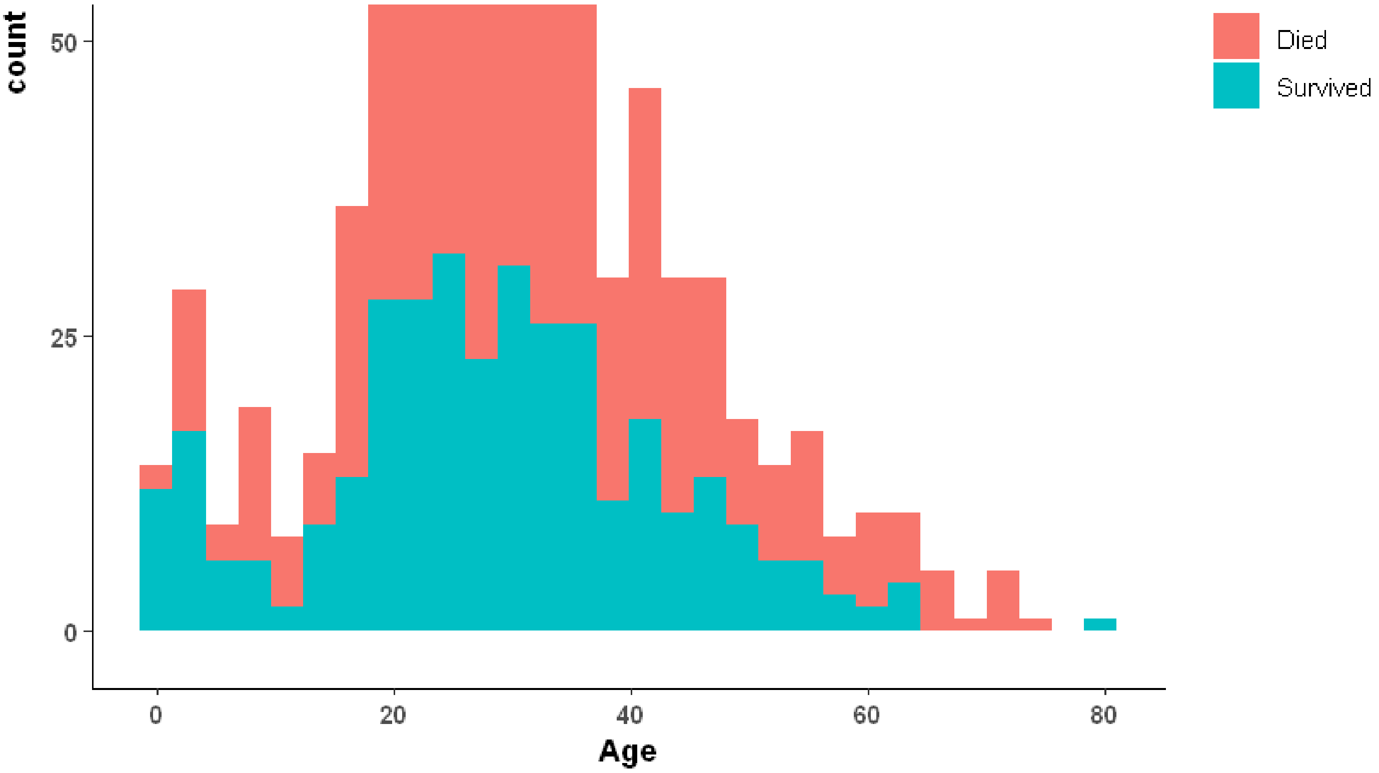
In [34]:

```
titanic_data %>%
  ggplot(aes(x = Age, fill = Survived)) +
  geom_histogram() +
  theme_classic() +
  theme(
    plot.title = element_text(family = "Times New Roman", hjust = 0.5),
    axis.text = element_text(family = "Times New Roman",face = "bold"),
    axis.title = element_text(family = "Times New Roman", face = "bold"),
    legend.title = element_blank(),
    legend.text = element_text(family = "Times New Roman")

  ) +
  labs(title = "Survival rates by Age")
```

```
`stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
Warning message in grid.Call(C_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call(C_textBounds
, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call(C_textBounds
, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call(C_textBounds
, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call(C_textBounds
, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call(C_textBounds
, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call(C_textBounds
, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call(C_textBounds
, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call(C_textBounds
, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call(C_textBounds
, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call.graphics(C_t
ext, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call(C_textBounds
, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call(C_textBounds
, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"
```



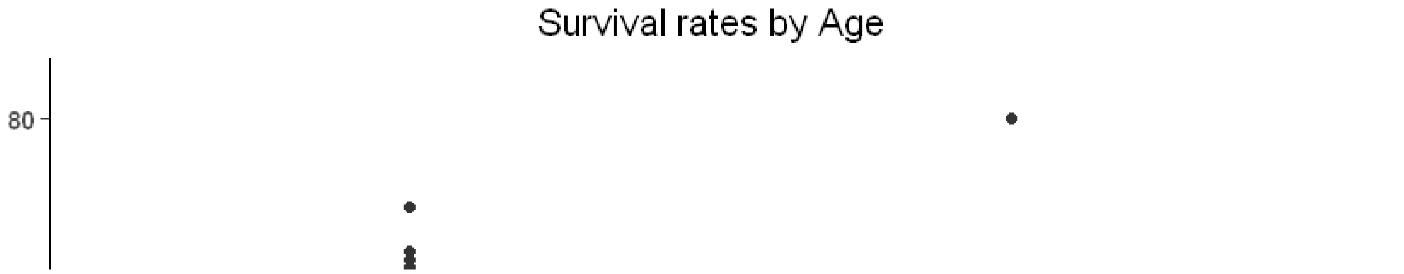


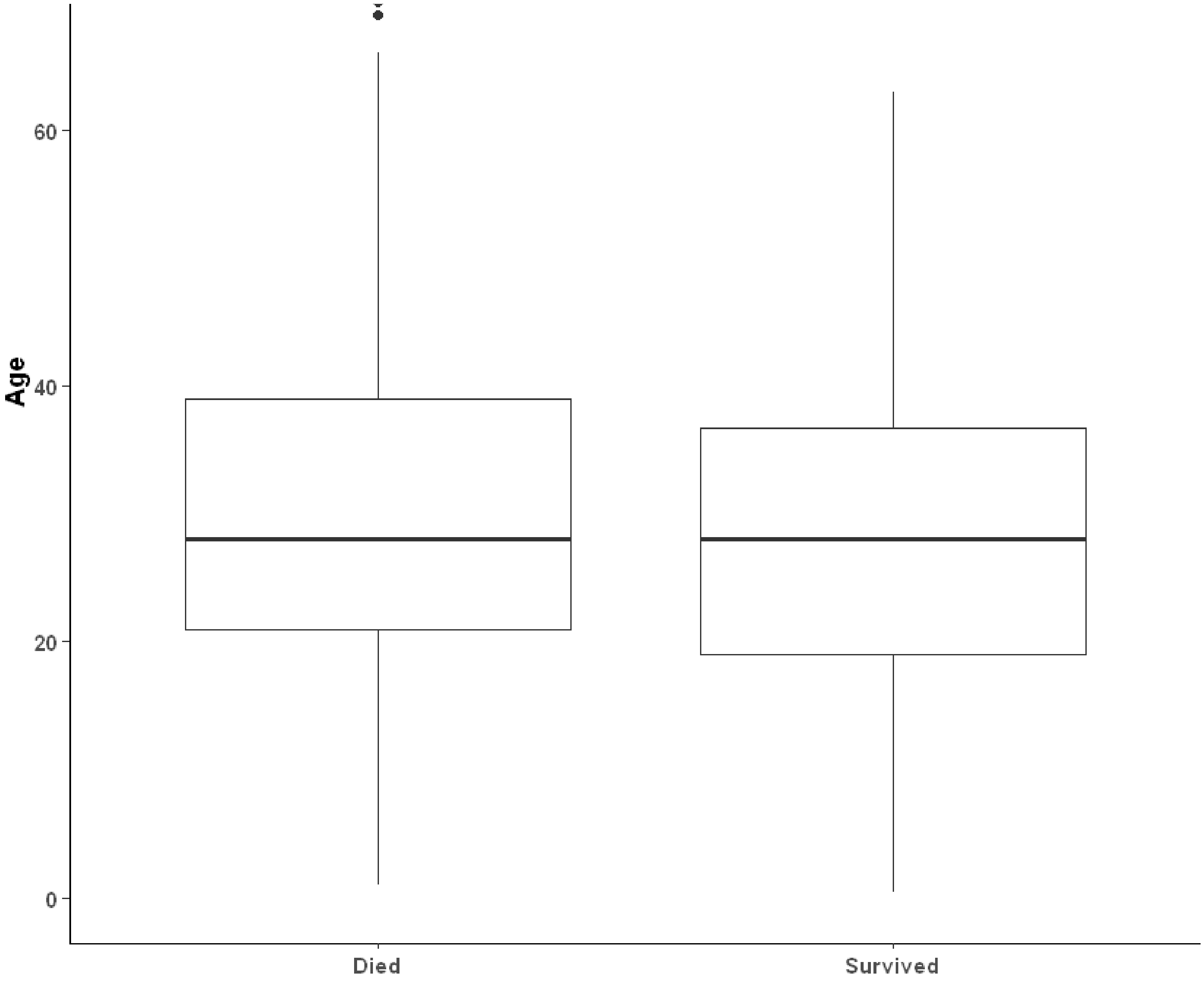
In [35]:

```
titanic_data %>%
  ggplot(aes(x = Survived, y = Age)) +
  geom_boxplot() +
  theme_classic() +
  theme(
    plot.title = element_text(family = "Times New Roman", hjust = 0.5),
    axis.text = element_text(family = "Times New Roman", face = "bold"),
    axis.title = element_text(family = "Times New Roman", face = "bold"),
    legend.title = element_blank(),
    legend.text = element_text(family = "Times New Roman")

  ) +
  labs(title = "Survival rates by Age", x = NULL)
```

```
Warning message in grid.Call(C_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call(C_textBounds
, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call(C_textBounds
, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call(C_textBounds
, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call(C_textBounds
, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call(C_textBounds
, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call(C_textBounds
, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call.graphics(C_t
ext, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call(C_textBounds
, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"
```





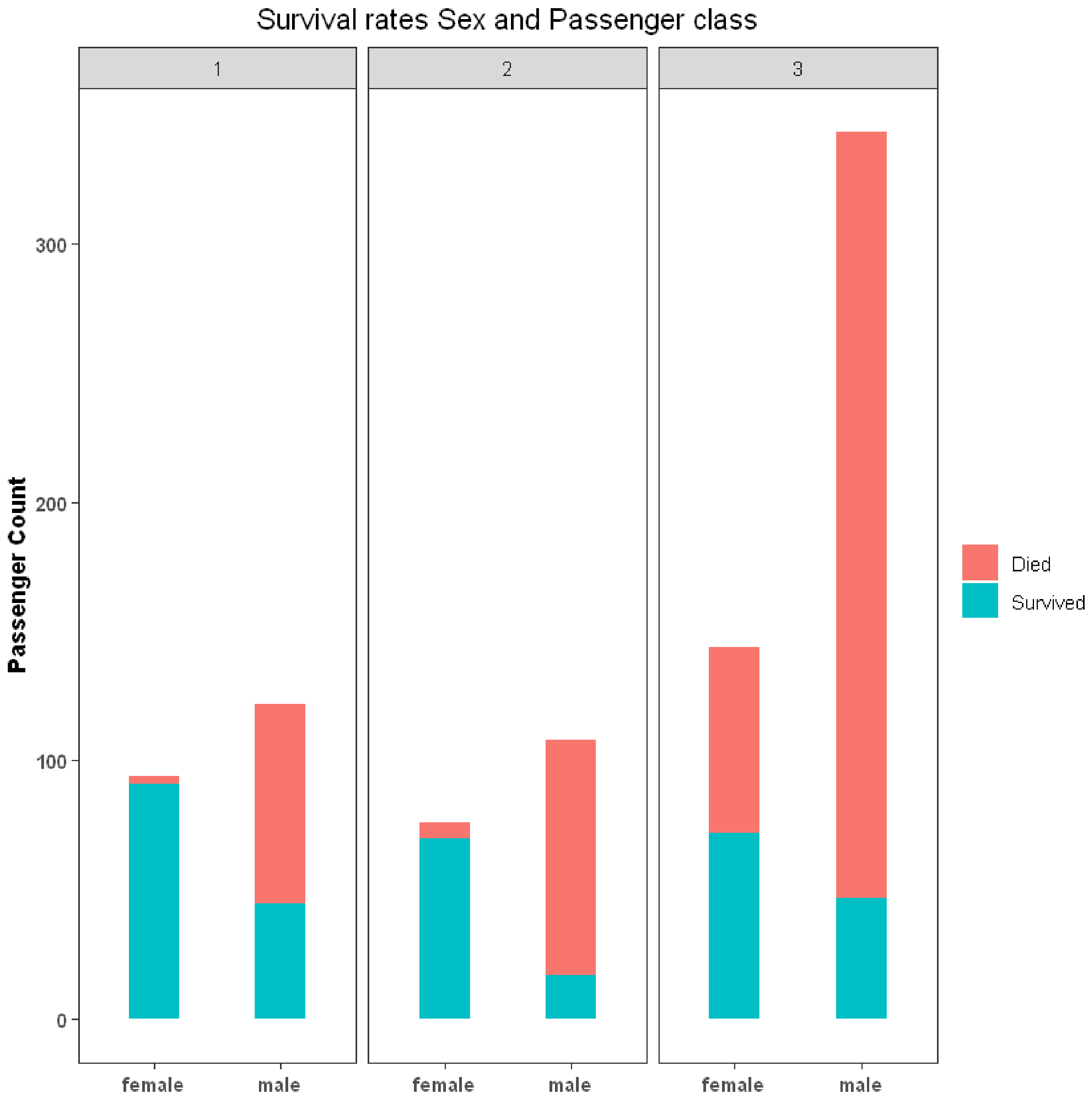
Survival rates by sex and Pclass

In [36]:

```
titanic_data %>%
  ggplot(aes(x = Sex, fill = Survived)) +
  geom_bar(width = 0.4) +
  facet_wrap(~ Pclass) +
  theme_test() +
  theme(
    plot.title = element_text(family = "Times New Roman", hjust = 0.5),
    axis.text = element_text(family = "Times New Roman", face = "bold"),
    axis.title = element_text(family = "Times New Roman", face = "bold"),
    legend.title = element_blank(),
    legend.text = element_text(family = "Times New Roman")

  ) +
  labs(title = "Survival rates Sex and Passenger class", x = NULL, y = "Passenger Count"
)
```

```
Warning message in grid.Call(C_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call(C_textBounds
, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call(C_textBounds
, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call(C_textBounds
, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call(C_textBounds
, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call(C_textBounds
, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call(C_textBounds
, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call.graphics(C_t
ext, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call(C_textBounds
, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call(C_textBounds
, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"
```



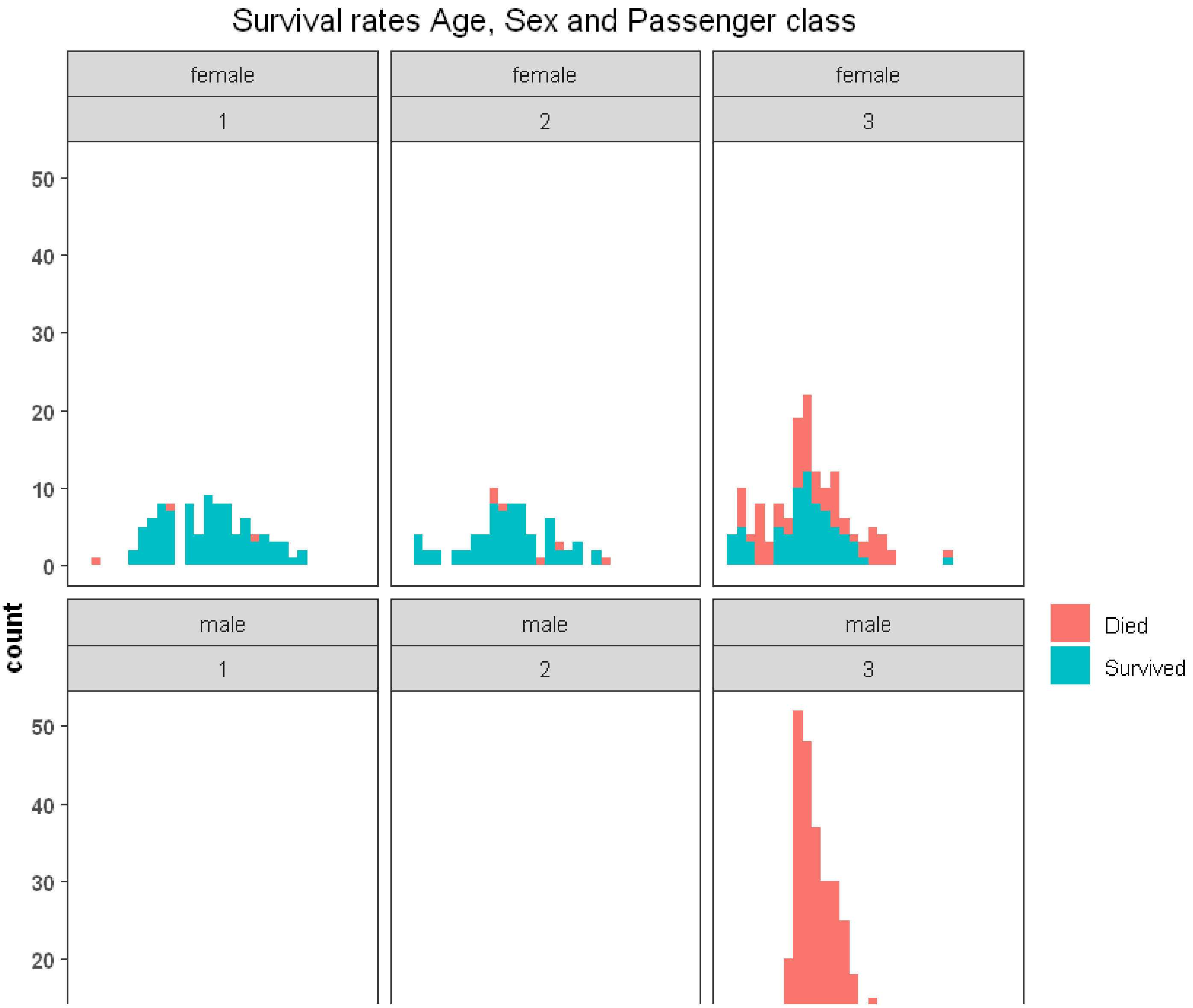
Survival rates by Age. Sex and Passenger Class

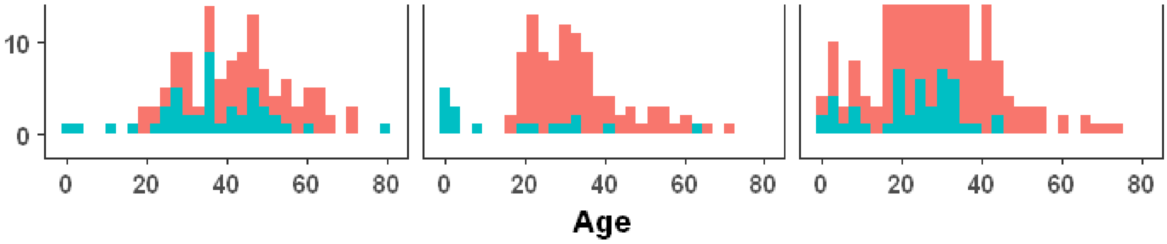
In [38]:

```
titanic_data %>%
  ggplot(aes(x = Age, fill = Survived)) +
  geom_histogram() +
  facet_wrap(~Sex + Pclass) +
  theme_test() +
  theme(
    plot.title = element_text(family = "Times New Roman", hjust = 0.5),
    axis.text = element_text(family = "Times New Roman", face = "bold"),
    axis.title = element_text(family = "Times New Roman", face = "bold"),
    legend.title = element_blank(),
    legend.text = element_text(family = "Times New Roman")

  ) +
  labs(title = "Survival rates Age, Sex and Passenger class")
```

```
`stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
Warning message in grid.Call(C_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call(C_textBounds
, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call(C_textBounds
, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call(C_textBounds
, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call(C_textBounds
, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call(C_textBounds
, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call(C_textBounds
, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call(C_textBounds
, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call.graphics(C_t
ext, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call(C_textBounds
, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"Warning message in grid.Call(C_textBounds
, as.graphicsAnnot(x$label), x$x, x$y, :
"font family not found in Windows font database"
```





In [39]:

```
titanic <- read.csv("train.csv")
```

In [41]:

```
str(titanic)
```

```
'data.frame':	891 obs. of  12 variables:
 $ PassengerId: int  1 2 3 4 5 6 7 8 9 10 ...
 $ Survived   : int  0 1 1 1 0 0 0 0 1 1 ...
 $ Pclass     : int  3 1 3 1 3 3 1 3 3 2 ...
 $ Name       : Factor w/ 891 levels "Abbing, Mr. Anthony",..: 109 191 358 277 16 559 520
629 417 581 ...
 $ Sex        : Factor w/ 2 levels "female","male": 2 1 1 1 2 2 2 2 1 1 ...
 $ Age        : num  22 38 26 35 35 NA 54 2 27 14 ...
 $ SibSp      : int  1 1 0 1 0 0 0 3 0 1 ...
 $ Parch      : int  0 0 0 0 0 0 0 1 2 0 ...
 $ Ticket     : Factor w/ 681 levels "110152","110413",..: 524 597 670 50 473 276 86 396
345 133 ...
 $ Fare       : num  7.25 71.28 7.92 53.1 8.05 ...
 $ Cabin      : Factor w/ 148 levels "","A10","A14",..: 1 83 1 57 1 1 131 1 1 1 ...
 $ Embarked   : Factor w/ 4 levels "","C","Q","S": 4 2 4 4 4 3 4 4 4 2 ...
```

In [42]:

```
head(titanic)
```

PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked
1	0	3	Braund, Mr. Owen Harris	male	22	1	0	A/5 21171	7.2500		S
2	1	1	Cumings, Mrs. John Bradley (Florence Briggs Thayer)	female	38	1	0	PC 17599	71.2833	C85	C
3	1	3	Heikkinen, Miss. Laina	female	26	0	0	STON/O2. 3101282	7.9250		S
4	1	1	Futrelle, Mrs. Jacques Heath (Lily May Peel)	female	35	1	0	113803	53.1000	C123	S
5	0	3	Allen, Mr. William Henry	male	35	0	0	373450	8.0500		S
6	0	3	Moran, Mr. James	male	NA	0	0	330877	8.4583		Q

In [43]:

```
## removing insignificant variables
titanic <- subset(titanic, select = c(2,3,5,6,7,8,10,12))
```

In [44]:

```
## checking if the variable are categorical or not
is.factor(titanic$Sex)
```

TRUE

In [45]:

```
is.factor(titanic$Embarked)
```

TRUE

In [46]:

```
#removing missing value by Knn Approach
library(DMwR)
```

```
Warning message:
"package 'DMwR' was built under R version 3.6.3"Loading required package: lattice
Loading required package: grid
Registered S3 method overwritten by 'xts':
  method     from
  as.zoo.xts zoo
Registered S3 method overwritten by 'quantmod':
  method            from
  as.zoo.data.frame zoo
```

In [47]:

```
summary(is.na(titanic))
```

```
  Survived          Pclass            Sex               Age         
 Mode :logical   Mode :logical   Mode :logical   Mode :logical  
 FALSE:891       FALSE:891       FALSE:891       FALSE:714      
                                                 TRUE :177      
   SibSp            Parch             Fare           Embarked      
 Mode :logical   Mode :logical   Mode :logical   Mode :logical  
 FALSE:891       FALSE:891       FALSE:891       FALSE:891      
```

In [48]:

```
titanic <- knnImputation(titanic)
```

In [49]:

```
summary(is.na(titanic))
```

```
  Survived          Pclass            Sex               Age         
 Mode :logical   Mode :logical   Mode :logical   Mode :logical  
 FALSE:891       FALSE:891       FALSE:891       FALSE:891      
   SibSp            Parch             Fare           Embarked      
 Mode :logical   Mode :logical   Mode :logical   Mode :logical  
 FALSE:891       FALSE:891       FALSE:891       FALSE:891      
```

In [50]:

```
dim(titanic)
```

891 8

In [51]:

```
train <- titanic[1:800,]
test <- titanic[801:891,]
```

In [52]:

```
# fitting the logistic regression when considering all the predictors
basemodel <- glm(Survived~., family = binomial(link = "logit"), data = train)
```

In [53]:

```
summary(basemodel)
```

```
Call:
glm(formula = Survived ~ ., family = binomial(link = "logit"), 
    data = train)

Deviance Residuals: 
    Min       1Q   Median       3Q      Max  
-2.7536  -0.5968  -0.4042   0.6255   2.5013  

Coefficients:
```

```
Coefficients:
              Estimate Std. Error z value Pr(>|z|)    
(Intercept)  1.664e+01  5.354e+02   0.031  0.97521    
Pclass      -1.266e+00  1.614e-01  -7.845 4.32e-15 ***
Sexmale     -2.688e+00  2.147e-01 -12.523  < 2e-16 ***
Age         -4.917e-02  8.499e-03  -5.786 7.22e-09 ***
SibSp       -3.728e-01  1.170e-01  -3.186  0.00144 ** 
Parch       -1.096e-01  1.321e-01  -0.830  0.40664    
Fare         7.557e-04  2.333e-03   0.324  0.74604    
EmbarkedC   -1.076e+01  5.354e+02  -0.020  0.98396    
EmbarkedQ   -1.076e+01  5.354e+02  -0.020  0.98397    
EmbarkedS   -1.103e+01  5.354e+02  -0.021  0.98356    
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

(Dispersion parameter for binomial family taken to be 1)

    Null deviance: 1066.33  on 799  degrees of freedom
Residual deviance:  694.26  on 790  degrees of freedom
AIC: 714.26

Number of Fisher Scoring iterations: 12
```

In [54]:

```
# analysis of variance table of the fitted model
anova(basemodel, test = "Chisq")
```

	Df	Deviance	Resid. Df	Resid. Dev	Pr(>Chi)
NULL	NA	NA	799	1066.3342	NA
Pclass	1	84.7785466	798	981.5557	3.337258e-20
Sex	1	240.0842621	797	741.4714	3.769924e-54
Age	1	27.5631328	796	713.9083	1.520495e-07
SibSp	1	16.8676478	795	697.0407	4.007893e-05
Parch	1	0.7983955	794	696.2423	3.715735e-01
Fare	1	0.3501133	793	695.8921	5.540490e-01
Embarked	3	1.6292692	790	694.2629	6.527716e-01

In [55]:

```
# fitting of logistic regression when considering only the statistically significant pred
ictors
model <- glm(Survived~.-Parch-Fare-Embarked, family = binomial(link = "logit"),data = tr
ain)
```

In [56]:

```
summary(model)
```

```
Call:
glm(formula = Survived ~ . - Parch - Fare - Embarked, family = binomial(link = "logit"), 
    data = train)

Deviance Residuals: 
    Min       1Q   Median       3Q      Max  
-2.8272  -0.6029  -0.3846   0.6072   2.4906  

Coefficients:
             Estimate Std. Error z value Pr(>|z|)    
(Intercept)  5.801178   0.545447  10.636  < 2e-16 ***
Pclass      -1.308035   0.136657  -9.572  < 2e-16 ***
Sexmale     -2.688206   0.206902 -12.993  < 2e-16 ***
Age         -0.049877   0.008442  -5.908 3.46e-09 ***
SibSp       -0.415307   0.111385  -3.729 0.000193 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
(Dispersion parameter for binomial family taken to be 1)

    Null deviance: 1066.33  on 799  degrees of freedom
Residual deviance:  697.04  on 795  degrees of freedom
AIC: 707.04

Number of Fisher Scoring iterations: 5
```

In [57]:

```
anova(model, test = "Chisq")
```

	Df	Deviance	Resid. Df	Resid. Dev	Pr(>Chi)
NULL	NA	NA	799	1066.3342	NA
Pclass	1	84.77855	798	981.5557	3.337258e-20
Sex	1	240.08426	797	741.4714	3.769924e-54
Age	1	27.56313	796	713.9083	1.520495e-07
SibSp	1	16.86765	795	697.0407	4.007893e-05

In [58]:

```
predict <- predict(model,newdata = test,type = "response")
```

In [59]:

```
library(caret)
predict <- ifelse(predict > 0.5,1,0)
error <- mean(predict != test$Survived)
print(paste('Accuracy',1-error))
```

```
Attaching package: 'caret'

The following object is masked from 'package:purrr':

    lift

```

```
[1] "Accuracy 0.824175824175824"
```

In [2]:

```
```

'Not Equal FALSE'

In [ ]:

```
```