HW 07

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```
library(rattle)
```

```
## Loading required package: tibble
```

```
## Loading required package: bitops
```

```
## Rattle: A free graphical interface for data science with R.
## Version 5.4.0 Copyright (c) 2006-2020 Togaware Pty Ltd.
## Type 'rattle()' to shake, rattle, and roll your data.
```

```
library(tidyverse)
```

```
## ── Attaching packages ─────────────────────────────────────── tidyverse 1.
3.1 ──
```

```
## ✓ ggplot2 3.3.5     ✓ dplyr   1.0.7
## ✓ tidyr   1.1.3     ✓ stringr 1.4.0
## ✓ readr   2.0.1     ✓ forcats 0.5.1
## ✓ purrr   0.3.4
```

```
## ── Conflicts ────────────────────────────────────────── tidyverse_conflict
s() ──
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
```

```
library(caret)
```

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

```
##
## Attaching package: 'caret'
```

```
## The following object is masked from 'package:purrr':
##
##     lift
```

```
library(rpart)
```

```
titanic_data <- read.csv('~/OneDrive - Stony Brook University/SBU/MAT + AMS/F
all 2021/AMS 380/hw/07/Titanic.csv', header = T)
```

Question 01:

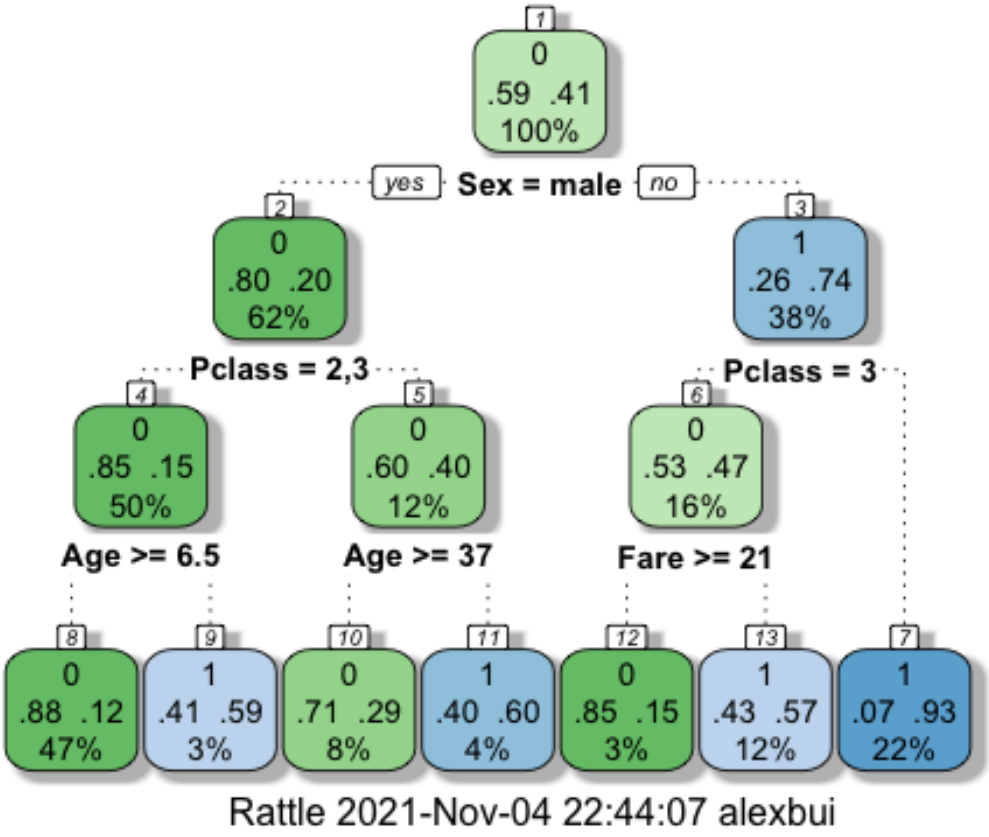
```
titanic_data <- subset(titanic_data, select = -c(Name, Ticket, Cabin))

titanic_data <- na.omit(titanic_data)
str(titanic_data)
```

```
## 'data.frame':    714 obs. of  9 variables:
##  $ PassengerId: int  1 2 3 4 5 7 8 9 10 11 ...
##  $ Survived   : int  0 1 1 1 0 0 0 1 1 1 ...
##  $ Pclass     : int  3 1 3 1 3 1 3 3 2 3 ...
##  $ Sex        : chr  "male" "female" "female" "female" ...
##  $ Age        : num  22 38 26 35 35 54 2 27 14 4 ...
##  $ SibSp      : int  1 1 0 1 0 0 3 0 1 1 ...
##  $ Parch      : int  0 0 0 0 0 0 1 2 0 1 ...
##  $ Fare       : num  7.25 71.28 7.92 53.1 8.05 ...
##  $ Embarked   : chr  "S" "C" "S" "S" ...
##  - attr(*, "na.action")= 'omit' Named int [1:177] 6 18 20 27 29 30 32 33 3
7 43 ...
##   ..- attr(*, "names")= chr [1:177] "6" "18" "20" "27" ...
```

```
# There are 714 observations left after omitting the missing data

titanic_data$Survived <- as.factor(titanic_data$Survived)
titanic_data$Pclass <- as.factor(titanic_data$Pclass)

# Generate training and testing data
set.seed(123)
training.samples <- titanic_data$Survived %>%
  createDataPartition(p = 0.8, list = FALSE)
train.data  <- titanic_data[training.samples, ]
test.data <- titanic_data[-training.samples, ]
```

Question 02:

```
fit <- rpart(Survived ~ Pclass + Sex + Age + SibSp + Parch + Fare + Embarked,
data = train.data, method="class")

fancyRpartPlot(fit)
```




```
predicted.classes <- fit %>%
  predict(test.data, type = "class")

predicted.survival <- data.frame(PassengerId = test.data$PassengerId, Survive
d = predicted.classes)
predicted.survival
```

```
##     PassengerId Survived
## 1             1        0
## 4             4        1
## 7             7        0
## 14           14        0
## 19           19        1
## 24           24        1
## 35           35        1
## 38           38        0
## 39           39        1
## 53           53        1
## 57           57        1
## 81           81        0
## 82           82        0
## 84           84        1
## 85           85        1
```

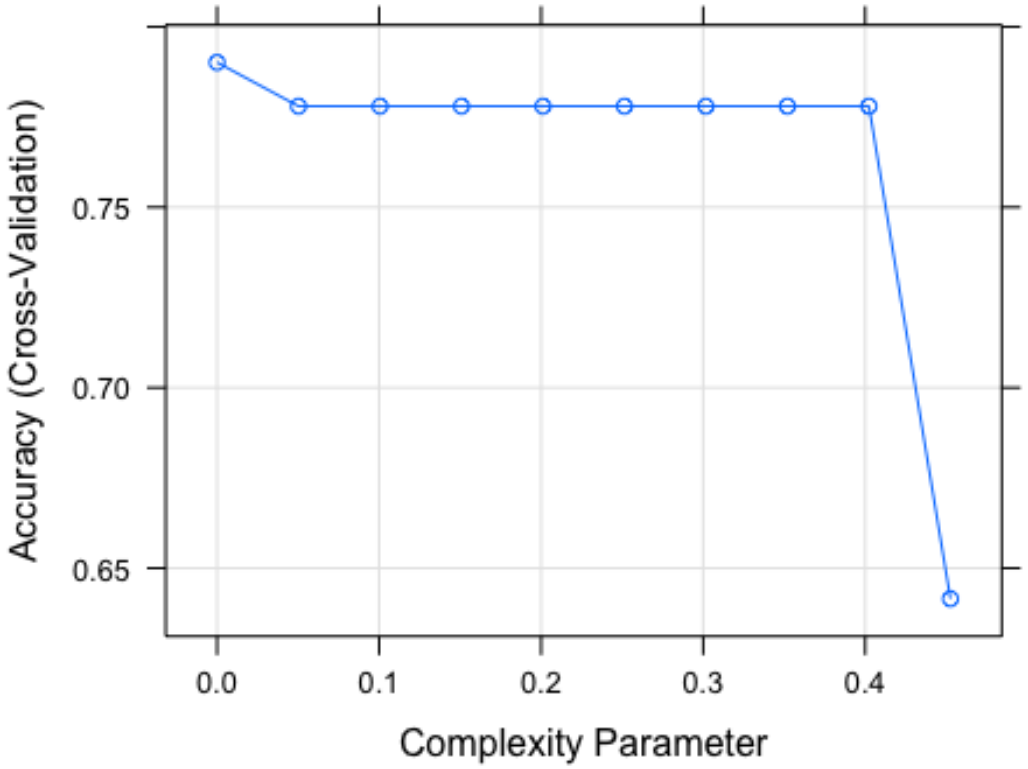
```
## 94           94        0
## 97           97        0
## 98           98        1
## 99           99        1
## 100         100        0
## 113         113        0
## 115         115        1
## 116         116        0
## 117         117        0
## 119         119        1
## 123         123        0
## 126         126        0
## 131         131        0
## 133         133        1
## 135         135        0
## 140         140        1
## 148         148        0
## 157         157        1
## 163         163        0
## 166         166        0
## 174         174        0
## 176         176        0
## 179         179        0
## 180         180        0
## 190         190        0
## 194         194        1
## 209         209        1
## 212         212        1
## 214         214        0
## 221         221        0
## 226         226        0
## 228         228        0
## 243         243        0
## 249         249        0
## 263         263        0
## 266         266        0
## 274         274        0
## 283         283        0
## 284         284        0
## 293         293        0
## 306         306        1
## 309         309        0
## 311         311        1
## 312         312        1
## 324         324        1
## 328         328        1
## 341         341        1
## 342         342        1
## 343         343        0
## 345         345        0
```

```
## 354          354         0
## 370          370         1
## 378          378         1
## 380          380         0
## 383          383         0
## 386          386         0
## 391          391         1
## 393          393         0
## 400          400         1
## 406          406         0
## 408          408         1
## 409          409         0
## 438          438         1
## 442          442         0
## 446          446         1
## 447          447         1
## 448          448         1
## 453          453         1
## 461          461         0
## 462          462         0
## 463          463         0
## 468          468         0
## 477          477         0
## 488          488         0
## 494          494         0
## 509          509         0
## 514          514         1
## 516          516         0
## 538          538         1
## 545          545         0
## 551          551         1
## 572          572         1
## 582          582         1
## 583          583         0
## 584          584         1
## 586          586         1
## 600          600         0
## 601          601         1
## 617          617         0
## 619          619         1
## 632          632         0
## 639          639         0
## 646          646         0
## 652          652         1
## 653          653         0
## 662          662         0
## 678          678         1
## 682          682         1
## 690          690         1
## 692          692         1
```

```
## 694          694         0
## 711          711         1
## 727          727         1
## 731          731         1
## 732          732         0
## 746          746         0
## 762          762         0
## 768          768         1
## 771          771         0
## 781          781         1
## 788          788         0
## 797          797         1
## 800          800         0
## 805          805         0
## 815          815         0
## 818          818         0
## 819          819         0
## 828          828         1
## 834          834         0
## 836          836         1
## 841          841         0
## 849          849         0
## 851          851         1
## 861          861         0
## 873          873         1
## 880          880         1
## 888          888         1
```

Question 03:

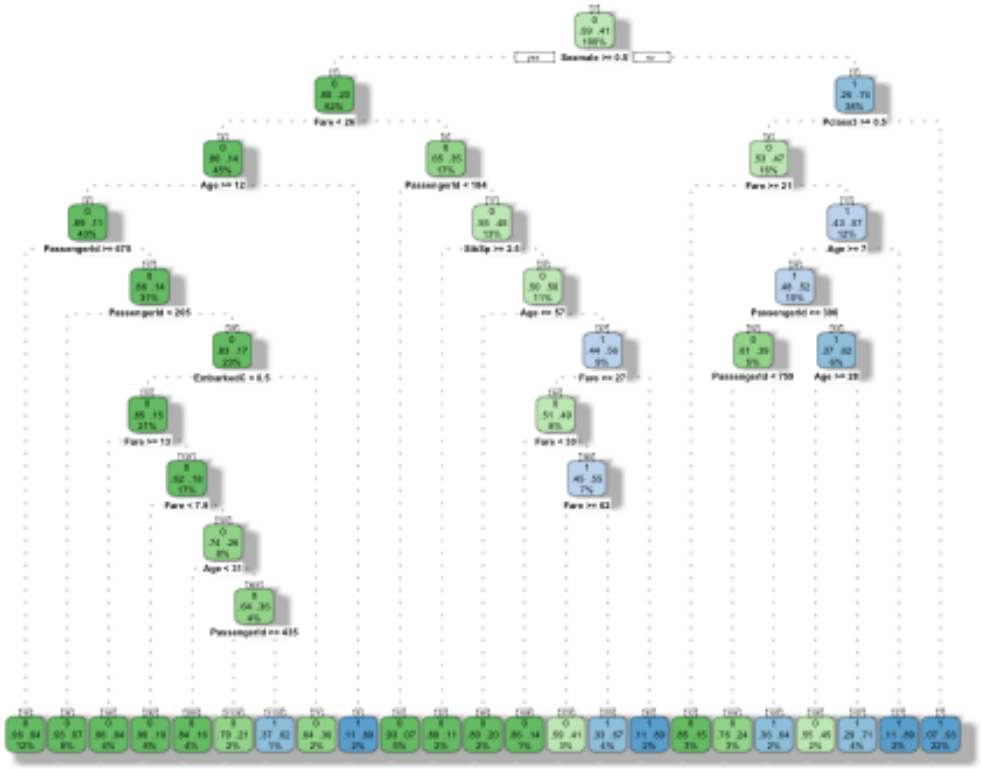
```
# Fit the model on the training set
set.seed(123)
model <- train(
  Survived ~., data = train.data, method = "rpart",
  trControl = trainControl("cv", number = 10),
  tuneLength = 10
  )

plot(model)
```




```
model$bestTune
```

```
##   cp
## 1  0
```

```
# The best CP value is 0

fancyRpartPlot(model$finalModel)
```



Question 04:

```
predicted.classes2 <- model %>% predict(test.data)
# Compute model accuracy rate on test data

# confusion matrix
table(predicted.classes2, test.data$Survived)

##
## predicted.classes2  0  1
##                  0 71 14
##                  1 13 44

mean(predicted.classes2 == test.data$Survived)

## [1] 0.8098592

# The overall accuracy of the test data is 0.8098592

sum((test.data$Survived == 1)*(predicted.classes2 == 1))/sum(test.data$Surviv
ed ==
1)
```

```
## [1] 0.7586207

# The sensitivity of the test data is 0.7586207

sum((test.data$Survived == 0)*(predicted.classes2 == 0))/sum(test.data$Surviv
ed ==
0)

## [1] 0.8452381

# The specificity of the test data is 0.8452381
```