```
> #job and eduducation are the only columns now with missing data.
> #imputing data with mice package.
> library(mice)
Loading required package: lattice

Attaching package: ‘mice’

The following objects are masked from ‘package:base’:

    cbind, rbind

> md.pattern(bank_data2)
      age marital default balance housing loan contact day month duration
43193   1       1       1       1       1    1       1   1     1        1
1730    1       1       1       1       1    1       1   1     1        1
161     1       1       1       1       1    1       1   1     1        1
127     1       1       1       1       1    1       1   1     1        1
        0       0       0       0       0    0       0   0     0        0
      campaign pdays previous y job education
43193         1     1        1 1   1         1    0
1730          1     1        1 1   1         0    1
161           1     1        1 1   0         1    1
127           1     1        1 1   0         0    2
              0     0        0 0 288      1857 2145
> head(bank_data2)
# A tibble: 6 x 16
    age   job marital education default balance housing  loan contact   day
  <int> <int>   <int>     <int>   <int>   <int>   <int> <int>   <dbl> <int>
1    58     5       2         3       1    2143       2     1       0     5
2    44    10       3         2       1      29       2     1       0     5
3    33     3       2         2       1       2       2     2       0     5
4    47     2       2        NA       1    1506       2     1       0     5
5    33    NA       3        NA       1       1       1     1       0     5
6    35     5       2         3       1     231       2     1       0     5
# ... with 6 more variables: month <int>, duration <int>, campaign <int>,
#   pdays <int>, previous <int>, y <int>
> library(dplyr)

Attaching package: ‘dplyr’

The following objects are masked from ‘package:stats’:

    filter, lag

The following objects are masked from ‘package:base’:

    intersect, setdiff, setequal, union

> bank_data2 <- bank_data2 %>%
+   mutate(
+     job = as.factor(job),
+     education = as.factor(education),
+     marital = as.factor(marital),
+     default = as.factor(default),
+     housing = as.factor(housing),
+     loan = as.factor(loan),
+     contact = as.factor(contact)
+   )
> bank_data2 <- bank_data2 %>%
+   mutate(
+     job = as.factor(job),
+     education = as.factor(education),
+     marital = as.factor(marital),
```

```
+     default = as.factor(default),
+     housing = as.factor(housing),
+     loan = as.factor(loan),
+     contact = as.factor(contact)
+   )
> str(bank_data2)
Classes ‘tbl_df’, ‘tbl’ and 'data.frame':    45211 obs. of  16 variables:
 $ age      : int  58 44 33 47 33 35 28 42 58 43 ...
 $ job      : Factor w/ 11 levels "1","2","3","4",..: 5 10 3 2 NA 5 5 3 6 10
...
 $ marital  : Factor w/ 3 levels "1","2","3": 2 3 2 2 3 2 3 1 2 3 ...
 $ education: Factor w/ 3 levels "1","2","3": 3 2 2 NA NA 3 3 3 1 2 ...
 $ default  : Factor w/ 2 levels "1","2": 1 1 1 1 1 1 1 2 1 1 ...
 $ balance  : int  2143 29 2 1506 1 231 447 2 121 593 ...
 $ housing  : Factor w/ 2 levels "1","2": 2 2 2 2 1 2 2 2 2 2 ...
 $ loan     : Factor w/ 2 levels "1","2": 1 1 2 1 1 1 2 1 1 1 ...
 $ contact  : Factor w/ 3 levels "0","1","2": 1 1 1 1 1 1 1 1 1 1 ...
 $ day      : int  5 5 5 5 5 5 5 5 5 5 ...
 $ month    : int  9 9 9 9 9 9 9 9 9 9 ...
 $ duration : int  261 151 76 92 198 139 217 380 50 55 ...
 $ campaign : int  1 1 1 1 1 1 1 1 1 1 ...
 $ pdays    : int  -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 ...
 $ previous : int  0 0 0 0 0 0 0 0 0 0 ...
 $ y        : int  1 1 1 1 1 1 1 1 1 1 ...
> #running the mice function
> bank_data3 <- mice(bank_data2,m=3,maxit=10,seed=500)

 iter imp variable
  1   1  job  education
  1   2  job  education
  1   3  job  education
  2   1  job  education
  2   2  job  education
  2   3  job  education
  3   1  job  education
  3   2  job  education
  3   3  job  education
  4   1  job  education
  4   2  job  education
  4   3  job  education
  5   1  job  education
  5   2  job  education
  5   3  job  education
  6   1  job  education
  6   2  job  education
  6   3  job  education
  7   1  job  education
  7   2  job  education
  7   3  job  education
  8   1  job  education
  8   2  job  education
  8   3  job  education
  9   1  job  education
  9   2  job  education
  9   3  job  education
  10   1  job  education
  10   2  job  education
  10   3  job  education
```