Assignment 1- R Programming

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Health Informatics Program T402
George Brown College
COMP 4033
Health Info system analys and evaluation

Prepared by Group 8

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R Markdown

```
#r  import data

Hospitals <- read.csv("C:/Users/owner/Desktop/Health informatics/Semester 2/COMP-4033/Group 8/test_data

library(tidyverse)
```

```
## -- Attaching core tidyverse packages ------------------------ tidyverse 2.0.0 --
## v dplyr     1.1.4     v readr     2.1.5
## v forcats   1.0.0     v stringr   1.5.1
## v ggplot2   3.4.4     v tibble    3.2.1
## v lubridate 1.9.3     v tidyr     1.3.0
## v purrr     1.0.2
## -- Conflicts ------------------------------------------ tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
## i Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to become errors
```

```
library(ggplot2)
```

```
# 1/Print the structure of your dataset.

        str( Hospitals)
```

```
## 'data.frame':    137057 obs. of  17 variables:
##  $ case_id                          : int  318439 318440 318441 318442 318443 318444 318445 318446 3
##  $ Hospital_code                    : int  21 29 26 6 28 23 26 25 23 23 ...
##  $ Hospital_type_code               : chr  "c" "a" "b" "a" ...
##  $ City_Code_Hospital               : int  3 4 2 6 11 6 2 1 6 6 ...
##  $ Hospital_region_code             : chr  "Z" "X" "Y" "X" ...
##  $ Available.Extra.Rooms.in.Hospital: int  3 2 3 3 2 3 2 4 4 3 ...
##  $ Department                       : chr  "gynecology" "gynecology" "gynecology" "gynecology" ...
##  $ Ward_Type                        : chr  "S" "S" "Q" "Q" ...
##  $ Ward_Facility_Code               : chr  "A" "F" "D" "F" ...
##  $ Bed.Grade                        : num  2 2 4 2 2 2 2 3 3 4 ...
##  $ patientid                        : int  17006 17006 17006 17006 17006 17006 17006 95946 95946 9594
##  $ City_Code_Patient                : num  2 2 2 2 2 2 2 NA NA NA ...
##  $ Type.of.Admission                : chr  "Emergency" "Trauma" "Emergency" "Trauma" ...
##  $ Severity.of.Illness              : chr  "Moderate" "Moderate" "Moderate" "Moderate" ...
##  $ Visitors.with.Patient            : int  2 4 3 3 4 2 2 2 2 2 ...
##  $ Age                              : chr  "71-80" "71-80" "71-80" "71-80" ...
##  $ Admission_Deposit                : num  3095 4018 4492 4173 4161 ...
```

```
# 2/List the variables in your dataset.
    # list the variables in mydata

     names(Hospitals)
```

```
##  [1] "case_id"                          "Hospital_code"
```

```
##  [3] "Hospital_type_code"               "City_Code_Hospital"
##  [5] "Hospital_region_code"             "Available.Extra.Rooms.in.Hospital"
##  [7] "Department"                       "Ward_Type"
##  [9] "Ward_Facility_Code"               "Bed.Grade"
## [11] "patientid"                        "City_Code_Patient"
## [13] "Type.of.Admission"                "Severity.of.Illness"
## [15] "Visitors.with.Patient"            "Age"
## [17] "Admission_Deposit"
```

```r
# 3/Print the top 15 rows of your dataset.


    head(Hospitals, n=15)
```

```
##    case_id Hospital_code Hospital_type_code City_Code_Hospital
## 1   318439            21                  c                  3
## 2   318440            29                  a                  4
## 3   318441            26                  b                  2
## 4   318442             6                  a                  6
## 5   318443            28                  b                 11
## 6   318444            23                  a                  6
## 7   318445            26                  b                  2
## 8   318446            25                  e                  1
## 9   318447            23                  a                  6
## 10  318448            23                  a                  6
## 11  318449            10                  e                  1
## 12  318450             4                  a                  4
## 13  318451            16                  c                  3
## 14  318452            28                  b                 11
## 15  318453            19                  a                  7
##    Hospital_region_code Available.Extra.Rooms.in.Hospital Department Ward_Type
## 1                     Z                                3 gynecology         S
## 2                     X                                2 gynecology         S
## 3                     Y                                3 gynecology         Q
## 4                     X                                3 gynecology         Q
## 5                     X                                2 gynecology         R
## 6                     X                                3 gynecology         Q
## 7                     Y                                2 gynecology         Q
## 8                     X                                4 gynecology         S
## 9                     X                                4 gynecology         Q
## 10                    X                                3 gynecology         Q
## 11                    X                                4 gynecology         Q
## 12                    X                                3 gynecology         R
## 13                    Z                                4 gynecology         R
## 14                    X                                3 gynecology         R
## 15                    Y                                1 gynecology         S
##    Ward_Facility_Code Bed.Grade patientid City_Code_Patient Type.of.Admission
## 1                   A         2     17006                 2         Emergency
## 2                   F         2     17006                 2            Trauma
## 3                   D         4     17006                 2         Emergency
## 4                   F         2     17006                 2            Trauma
## 5                   F         2     17006                 2            Trauma
## 6                   F         2     17006                 2            Trauma
## 7                   D         2     17006                 2            Trauma
```

```
## 8                   E         3     95946                NA         Emergency
## 9                   F         3     95946                NA            Trauma
## 10                  F         4     95946                NA            Urgent
## 11                  E         2     95946                NA            Trauma
## 12                  F         3     95946                NA         Emergency
## 13                  A         3     95946                NA            Trauma
## 14                  F         4     95946                NA            Urgent
## 15                  C         2     40728                 8         Emergency
##    Severity.of.Illness Visitors.with.Patient   Age Admission_Deposit
## 1             Moderate                     2 71-80             3095
## 2             Moderate                     4 71-80             4018
## 3             Moderate                     3 71-80             4492
## 4             Moderate                     3 71-80             4173
## 5             Moderate                     4 71-80             4161
## 6             Moderate                     2 71-80             4659
## 7             Moderate                     2 71-80             4167
## 8             Moderate                     2 31-40             4396
## 9             Moderate                     2 31-40             4088
## 10            Moderate                     2 31-40             3925
## 11            Moderate                     2 31-40             4241
## 12            Moderate                     6 31-40             3468
## 13            Moderate                     3 31-40             4322
## 14            Moderate                     2 31-40             4315
## 15            Moderate                     4 51-60             3288
```

```
# 4/Write a user defined function using any of the variables from the data set.

      Addittion <- function(){sum(Hospitals$Admission_Deposit)}
      Addittion()
```

```
## [1] 667430735
```

```
# 5/Use data manipulation techniques and filter rows based on any logical criteria that exist in your d

   library(tidyverse)

      Hospital_bill = Hospitals%>%
      filter(Admission_Deposit>4000,Visitors.with.Patient<=3)
           head( Hospital_bill, n=30)
```

```
##    case_id Hospital_code Hospital_type_code City_Code_Hospital
## 1   318441            26                  b                  2
## 2   318442             6                  a                  6
## 3   318444            23                  a                  6
## 4   318445            26                  b                  2
## 5   318446            25                  e                  1
## 6   318447            23                  a                  6
## 7   318449            10                  e                  1
## 8   318451            16                  c                  3
## 9   318452            28                  b                 11
## 10  318458            25                  e                  1
## 11  318459            32                  f                  9
## 12  318461            11                  b                  2
```

```
## 13  318464             6                  a                  6
## 14  318467            23                  a                  6
## 15  318470            31                  c                  3
## 16  318476             5                  a                  1
## 17  318477            28                  b                 11
## 18  318479             6                  a                  6
## 19  318480            27                  a                  7
## 20  318481            10                  e                  1
## 21  318482            25                  e                  1
## 22  318484            26                  b                  2
## 23  318485            27                  a                  7
## 24  318486            29                  a                  4
## 25  318488            26                  b                  2
## 26  318495            27                  a                  7
## 27  318496             1                  d                 10
## 28  318497            26                  b                  2
## 29  318498            19                  a                  7
## 30  318500             8                  c                  3
##    Hospital_region_code Available.Extra.Rooms.in.Hospital   Department
## 1                     Y                                3   gynecology
## 2                     X                                3   gynecology
## 3                     X                                3   gynecology
## 4                     Y                                2   gynecology
## 5                     X                                4   gynecology
## 6                     X                                4   gynecology
## 7                     X                                4   gynecology
## 8                     Z                                4   gynecology
## 9                     X                                3   gynecology
## 10                    X                                2   anesthesia
## 11                    Y                                2   gynecology
## 12                    Y                                2   gynecology
## 13                    X                                2   gynecology
## 14                    X                                4   anesthesia
## 15                    Z                                4   gynecology
## 16                    X                                4   gynecology
## 17                    X                                3   gynecology
## 18                    X                                2   gynecology
## 19                    Y                                2 radiotherapy
## 20                    X                                2 radiotherapy
## 21                    X                                2 radiotherapy
## 22                    Y                                2   gynecology
## 23                    Y                                2 radiotherapy
## 24                    X                                3   gynecology
## 25                    Y                                3   gynecology
## 26                    Y                                2   gynecology
## 27                    Y                                3   gynecology
## 28                    Y                                3   gynecology
## 29                    Y                                3   gynecology
## 30                    Z                                2   gynecology
##    Ward_Type Ward_Facility_Code Bed.Grade patientid City_Code_Patient
## 1          Q                  D         4     17006                2
## 2          Q                  F         2     17006                2
## 3          Q                  F         2     17006                2
## 4          Q                  D         2     17006                2
```

```
## 5          S                  E         3     95946                NA
## 6          Q                  F         3     95946                NA
## 7          Q                  E         2     95946                NA
## 8          R                  A         3     95946                NA
## 9          R                  F         4     95946                NA
## 10         S                  E         2     40728                 8
## 11         S                  B         2     40728                 8
## 12         S                  D         3     40728                 8
## 13         R                  F         4    128946                 7
## 14         Q                  F         4    128946                 7
## 15         R                  A         2    111851                14
## 16         R                  E         1     71555                 1
## 17         R                  F         2     71555                 1
## 18         R                  F         3      3199                10
## 19         S                  C         2     10215                 8
## 20         Q                  E         2     10215                 8
## 21         Q                  E         3     10215                 8
## 22         R                  D         2     10215                 8
## 23         S                  C         2     10215                 8
## 24         R                  F         2    112031                 8
## 25         R                  D         1    127237                12
## 26         S                  C         1     12680                 8
## 27         T                  B         2     20014                 8
## 28         S                  D         4     20014                 8
## 29         S                  C         2     20014                 8
## 30         R                  F         2     20014                 8
##    Type.of.Admission Severity.of.Illness Visitors.with.Patient   Age
## 1          Emergency            Moderate                     3 71-80
## 2             Trauma            Moderate                     3 71-80
## 3             Trauma            Moderate                     2 71-80
## 4             Trauma            Moderate                     2 71-80
## 5          Emergency            Moderate                     2 31-40
## 6             Trauma            Moderate                     2 31-40
## 7             Trauma            Moderate                     2 31-40
## 8             Trauma            Moderate                     3 31-40
## 9             Urgent            Moderate                     2 31-40
## 10            Trauma            Moderate                     2 51-60
## 11            Urgent            Moderate                     2 51-60
## 12            Urgent            Moderate                     2 51-60
## 13            Trauma            Moderate                     3 51-60
## 14            Urgent            Moderate                     2 51-60
## 15         Emergency             Extreme                     3 41-50
## 16         Emergency               Minor                     3 41-50
## 17         Emergency               Minor                     3 41-50
## 18            Trauma               Minor                     3 51-60
## 19         Emergency            Moderate                     2 51-60
## 20         Emergency            Moderate                     2 51-60
## 21         Emergency            Moderate                     2 51-60
## 22            Trauma            Moderate                     2 51-60
## 23         Emergency            Moderate                     2 51-60
## 24         Emergency             Extreme                     3 41-50
## 25         Emergency             Extreme                     3 31-40
## 26         Emergency            Moderate                     2 51-60
## 27         Emergency            Moderate                     3 11-20
```

```
## 28         Emergency            Moderate                    2 11-20
## 29         Emergency            Moderate                    2 11-20
## 30            Trauma            Moderate                    2 11-20
##    Admission_Deposit
## 1               4492
## 2               4173
## 3               4659
## 4               4167
## 5               4396
## 6               4088
## 7               4241
## 8               4322
## 9               4315
## 10              6984
## 11              5716
## 12              5069
## 13              4884
## 14              5397
## 15              4204
## 16              4355
## 17              6972
## 18              4811
## 19              5426
## 20              5807
## 21              5181
## 22              5407
## 23              5721
## 24              4482
## 25              4321
## 26              5021
## 27              5225
## 28              5539
## 29              5540
## 30              4434
```

```
# 6/Identify the dependent & independent variables and use reshaping techniques and create a new data f


        reshaping_data <- head(Hospitals, n=30)

        cleaned_data = unique(reshaping_data)

        cleaned_data %>% distinct(case_id,.keep_all = TRUE)
```

```
##    case_id Hospital_code Hospital_type_code City_Code_Hospital
## 1   318439            21                  c                  3
## 2   318440            29                  a                  4
## 3   318441            26                  b                  2
## 4   318442             6                  a                  6
## 5   318443            28                  b                 11
## 6   318444            23                  a                  6
## 7   318445            26                  b                  2
## 8   318446            25                  e                  1
## 9   318447            23                  a                  6
```

```
## 10  318448            23                  a                  6
## 11  318449            10                  e                  1
## 12  318450             4                  a                  4
## 13  318451            16                  c                  3
## 14  318452            28                  b                 11
## 15  318453            19                  a                  7
## 16  318454            26                  b                  2
## 17  318455            19                  a                  7
## 18  318456            26                  b                  2
## 19  318457            23                  a                  6
## 20  318458            25                  e                  1
## 21  318459            32                  f                  9
## 22  318460            26                  b                  2
## 23  318461            11                  b                  2
## 24  318462             6                  a                  6
## 25  318463             1                  d                 10
## 26  318464             6                  a                  6
## 27  318465            15                  c                  5
## 28  318466            15                  c                  5
## 29  318467            23                  a                  6
## 30  318468             6                  a                  6
##    Hospital_region_code Available.Extra.Rooms.in.Hospital Department Ward_Type
## 1                     Z                                3 gynecology         S
## 2                     X                                2 gynecology         S
## 3                     Y                                3 gynecology         Q
## 4                     X                                3 gynecology         Q
## 5                     X                                2 gynecology         R
## 6                     X                                3 gynecology         Q
## 7                     Y                                2 gynecology         Q
## 8                     X                                4 gynecology         S
## 9                     X                                4 gynecology         Q
## 10                    X                                3 gynecology         Q
## 11                    X                                4 gynecology         Q
## 12                    X                                3 gynecology         R
## 13                    Z                                4 gynecology         R
## 14                    X                                3 gynecology         R
## 15                    Y                                1 gynecology         S
## 16                    Y                                5 gynecology         S
## 17                    Y                                2 gynecology         S
## 18                    Y                                3 gynecology         P
## 19                    X                                4 anesthesia         Q
## 20                    X                                2 anesthesia         S
## 21                    Y                                2 gynecology         S
## 22                    Y                                2 gynecology         R
## 23                    Y                                2 gynecology         S
## 24                    X                                2 anesthesia         R
## 25                    Y                                3 gynecology         R
## 26                    X                                2 gynecology         R
## 27                    Z                                4 gynecology         P
## 28                    Z                                6 gynecology         P
## 29                    X                                4 anesthesia         Q
## 30                    X                                3 gynecology         Q
##    Ward_Facility_Code Bed.Grade patientid City_Code_Patient Type.of.Admission
## 1                   A         2     17006                 2         Emergency
```

```
## 2                  F         2     17006                2           Trauma
## 3                  D         4     17006                2        Emergency
## 4                  F         2     17006                2           Trauma
## 5                  F         2     17006                2           Trauma
## 6                  F         2     17006                2           Trauma
## 7                  D         2     17006                2           Trauma
## 8                  E         3     95946               NA        Emergency
## 9                  F         3     95946               NA           Trauma
## 10                 F         4     95946               NA           Urgent
## 11                 E         2     95946               NA           Trauma
## 12                 F         3     95946               NA        Emergency
## 13                 A         3     95946               NA           Trauma
## 14                 F         4     95946               NA           Urgent
## 15                 C         2     40728                8        Emergency
## 16                 D         4     40728                8        Emergency
## 17                 C         4     40728                8        Emergency
## 18                 D         4     40728                8           Trauma
## 19                 F         2     40728                8        Emergency
## 20                 E         2     40728                8           Trauma
## 21                 B         2     40728                8           Urgent
## 22                 D         3     40728                8           Urgent
## 23                 D         3     40728                8           Urgent
## 24                 F         3    128946                7        Emergency
## 25                 B         2    128946                7           Trauma
## 26                 F         4    128946                7           Trauma
## 27                 F         3    128946                7           Trauma
## 28                 F         2    128946                7        Emergency
## 29                 F         4    128946                7           Urgent
## 30                 F         3    128946                7           Urgent
##    Severity.of.Illness Visitors.with.Patient   Age Admission_Deposit
## 1             Moderate                     2 71-80             3095
## 2             Moderate                     4 71-80             4018
## 3             Moderate                     3 71-80             4492
## 4             Moderate                     3 71-80             4173
## 5             Moderate                     4 71-80             4161
## 6             Moderate                     2 71-80             4659
## 7             Moderate                     2 71-80             4167
## 8             Moderate                     2 31-40             4396
## 9             Moderate                     2 31-40             4088
## 10            Moderate                     2 31-40             3925
## 11            Moderate                     2 31-40             4241
## 12            Moderate                     6 31-40             3468
## 13            Moderate                     3 31-40             4322
## 14            Moderate                     2 31-40             4315
## 15            Moderate                     4 51-60             3288
## 16            Moderate                     4 51-60             6818
## 17            Moderate                     2 51-60             3410
## 18            Moderate                     6 51-60             4782
## 19            Moderate                     4 51-60             5357
## 20            Moderate                     2 51-60             6984
## 21            Moderate                     2 51-60             5716
## 22            Moderate                     6 51-60             3410
## 23            Moderate                     2 51-60             5069
## 24            Moderate                     4 51-60             4596
```

```
## 25            Moderate                    6 51-60             3933
## 26            Moderate                    3 51-60             4884
## 27            Moderate                    4 51-60             5138
## 28            Moderate                    6 51-60             3753
## 29            Moderate                    2 51-60             5397
## 30            Moderate                    5 51-60             3143
```

```
 #first Dataset is  cleaned_data1
              cleaned_data1 = cleaned_data %>%
               select(case_id, Admission_Deposit,Severity.of.Illness)
              cleaned_data1
```

```
##    case_id Admission_Deposit Severity.of.Illness
## 1   318439              3095            Moderate
## 2   318440              4018            Moderate
## 3   318441              4492            Moderate
## 4   318442              4173            Moderate
## 5   318443              4161            Moderate
## 6   318444              4659            Moderate
## 7   318445              4167            Moderate
## 8   318446              4396            Moderate
## 9   318447              4088            Moderate
## 10  318448              3925            Moderate
## 11  318449              4241            Moderate
## 12  318450              3468            Moderate
## 13  318451              4322            Moderate
## 14  318452              4315            Moderate
## 15  318453              3288            Moderate
## 16  318454              6818            Moderate
## 17  318455              3410            Moderate
## 18  318456              4782            Moderate
## 19  318457              5357            Moderate
## 20  318458              6984            Moderate
## 21  318459              5716            Moderate
## 22  318460              3410            Moderate
## 23  318461              5069            Moderate
## 24  318462              4596            Moderate
## 25  318463              3933            Moderate
## 26  318464              4884            Moderate
## 27  318465              5138            Moderate
## 28  318466              3753            Moderate
## 29  318467              5397            Moderate
## 30  318468              3143            Moderate
```

```
 #second dataset is cleaned_data2

               cleaned_data2= cleaned_data %>%
              select(case_id, Department,Bed.Grade)
               cleaned_data2
```

```
##    case_id Department Bed.Grade
## 1   318439 gynecology         2
## 2   318440 gynecology         2
```

```
## 3   318441 gynecology         4
## 4   318442 gynecology         2
## 5   318443 gynecology         2
## 6   318444 gynecology         2
## 7   318445 gynecology         2
## 8   318446 gynecology         3
## 9   318447 gynecology         3
## 10  318448 gynecology         4
## 11  318449 gynecology         2
## 12  318450 gynecology         3
## 13  318451 gynecology         3
## 14  318452 gynecology         4
## 15  318453 gynecology         2
## 16  318454 gynecology         4
## 17  318455 gynecology         4
## 18  318456 gynecology         4
## 19  318457 anesthesia         2
## 20  318458 anesthesia         2
## 21  318459 gynecology         2
## 22  318460 gynecology         3
## 23  318461 gynecology         3
## 24  318462 anesthesia         3
## 25  318463 gynecology         2
## 26  318464 gynecology         4
## 27  318465 gynecology         3
## 28  318466 gynecology         2
## 29  318467 anesthesia         4
## 30  318468 gynecology         3
```

```
# cbind the two dataset with Case_id

        patient_admission_details = cbind(cleaned_data1,cleaned_data2)

         head(patient_admission_details, n=30)
```

```
##    case_id Admission_Deposit Severity.of.Illness case_id Department Bed.Grade
## 1   318439              3095            Moderate  318439 gynecology         2
## 2   318440              4018            Moderate  318440 gynecology         2
## 3   318441              4492            Moderate  318441 gynecology         4
## 4   318442              4173            Moderate  318442 gynecology         2
## 5   318443              4161            Moderate  318443 gynecology         2
## 6   318444              4659            Moderate  318444 gynecology         2
## 7   318445              4167            Moderate  318445 gynecology         2
## 8   318446              4396            Moderate  318446 gynecology         3
## 9   318447              4088            Moderate  318447 gynecology         3
## 10  318448              3925            Moderate  318448 gynecology         4
## 11  318449              4241            Moderate  318449 gynecology         2
## 12  318450              3468            Moderate  318450 gynecology         3
## 13  318451              4322            Moderate  318451 gynecology         3
## 14  318452              4315            Moderate  318452 gynecology         4
## 15  318453              3288            Moderate  318453 gynecology         2
## 16  318454              6818            Moderate  318454 gynecology         4
## 17  318455              3410            Moderate  318455 gynecology         4
## 18  318456              4782            Moderate  318456 gynecology         4
```

```
## 19  318457              5357           Moderate  318457 anesthesia         2
## 20  318458              6984           Moderate  318458 anesthesia         2
## 21  318459              5716           Moderate  318459 gynecology         2
## 22  318460              3410           Moderate  318460 gynecology         3
## 23  318461              5069           Moderate  318461 gynecology         3
## 24  318462              4596           Moderate  318462 anesthesia         3
## 25  318463              3933           Moderate  318463 gynecology         2
## 26  318464              4884           Moderate  318464 gynecology         4
## 27  318465              5138           Moderate  318465 gynecology         3
## 28  318466              3753           Moderate  318466 gynecology         2
## 29  318467              5397           Moderate  318467 anesthesia         4
## 30  318468              3143           Moderate  318468 gynecology         3
```

```
# 7/Remove missing values in your dataset.

                    H_clean<-Hospitals  %>%
                        na.omit(H_clean)
```

```
# 8/Identify and remove duplicated data from your dataset.



              Hospitals_clean <- H_clean %>%
                   distinct()

#  Hospitals_clean it is the clean data

        Used_data <-head(Hospitals_clean, n=40)
```

```
# 9/Reorder multiple rows in descending order

       library(dplyr)
      library(tidyverse)

       Reorder_data <-Used_data %>%
         select(case_id, City_Code_Hospital,Department, Admission_Deposit)


          Used_data_desc <- Reorder_data%>%
            arrange(desc(Department), desc(Admission_Deposit))
            Used_data_desc
```

```
##    case_id City_Code_Hospital         Department Admission_Deposit
## 1   318481                  1       radiotherapy              5807
## 2   318485                  7       radiotherapy              5721
## 3   318480                  7       radiotherapy              5426
## 4   318482                  1       radiotherapy              5181
## 5   318477                 11         gynecology              6972
## 6   318454                  2         gynecology              6818
## 7   318459                  9         gynecology              5716
## 8   318484                  2         gynecology              5407
## 9   318478                  6         gynecology              5349
## 10  318465                  5         gynecology              5138
```

```
## 11  318461                  2         gynecology             5069
## 12  318464                  6         gynecology             4884
## 13  318479                  6         gynecology             4811
## 14  318456                  2         gynecology             4782
## 15  318444                  6         gynecology             4659
## 16  318471                  6         gynecology             4551
## 17  318441                  2         gynecology             4492
## 18  318476                  1         gynecology             4355
## 19  318470                  3         gynecology             4204
## 20  318442                  6         gynecology             4173
## 21  318445                  2         gynecology             4167
## 22  318443                 11         gynecology             4161
## 23  318474                 13         gynecology             4050
## 24  318440                  4         gynecology             4018
## 25  318472                 10         gynecology             4000
## 26  318463                 10         gynecology             3933
## 27  318483                  7         gynecology             3772
## 28  318466                  5         gynecology             3753
## 29  318473                  3         gynecology             3570
## 30  318455                  7         gynecology             3410
## 31  318460                  2         gynecology             3410
## 32  318453                  7         gynecology             3288
## 33  318468                  6         gynecology             3143
## 34  318439                  3         gynecology             3095
## 35  318475                  6         gynecology             3090
## 36  318458                  1         anesthesia             6984
## 37  318467                  6         anesthesia             5397
## 38  318457                  6         anesthesia             5357
## 39  318462                  6         anesthesia             4596
## 40  318469                  6 TB & Chest disease             3839
```

```
# 10/   Rename some of the column names in your dataset.

            library(dplyr)

           Hospitals_rename <-Used_data %>%
             select(City_Code_Hospital,Type.of.Admission,Age, Available.Extra.Rooms.in.Hospital)
          colnames( Hospitals_rename) <-c("City_Code", "Admission", "Age.group", "Extra.Rooms")
              Hospitals_rename
```

```
##    City_Code Admission Age.group Extra.Rooms
## 1          3 Emergency     71-80           3
## 2          4    Trauma     71-80           2
## 3          2 Emergency     71-80           3
## 4          6    Trauma     71-80           3
## 5         11    Trauma     71-80           2
## 6          6    Trauma     71-80           3
## 7          2    Trauma     71-80           2
## 8          7 Emergency     51-60           1
## 9          2 Emergency     51-60           5
## 10         7 Emergency     51-60           2
## 11         2    Trauma     51-60           3
## 12         6 Emergency     51-60           4
## 13         1    Trauma     51-60           2
```

```
## 14         9    Urgent     51-60           2
## 15         2    Urgent     51-60           2
## 16         2    Urgent     51-60           2
## 17         6 Emergency     51-60           2
## 18        10    Trauma     51-60           3
## 19         6    Trauma     51-60           2
## 20         5    Trauma     51-60           4
## 21         5 Emergency     51-60           6
## 22         6    Urgent     51-60           4
## 23         6    Urgent     51-60           3
## 24         6    Urgent     51-60           4
## 25         3 Emergency     41-50           4
## 26         6    Trauma     41-50           3
## 27        10    Trauma     41-50           5
## 28         3    Trauma     41-50           6
## 29        13    Trauma     41-50           5
## 30         6 Emergency     41-50           2
## 31         1 Emergency     41-50           4
## 32        11 Emergency     41-50           3
## 33         6 Emergency     51-60           8
## 34         6    Trauma     51-60           2
## 35         7 Emergency     51-60           2
## 36         1 Emergency     51-60           2
## 37         1 Emergency     51-60           2
## 38         7 Emergency     51-60           6
## 39         2    Trauma     51-60           2
## 40         7 Emergency     51-60           2
```

```
# 11/Add new variables in your data frame by using a mathematical function (for e.g. - multiply an exis

              Total_Admission<-Used_data %>%

               select(City_Code_Hospital,Department, Bed.Grade, Type.of.Admission,Severity.of.Illness,
                      Visitors.with.Patient, Admission_Deposit)


             Total_Admission$Total_Deposit=Total_Admission$Admission_Deposit*.13+Total_Admission$Admis
              Total_Admission
```

```
##    City_Code_Hospital         Department Bed.Grade Type.of.Admission
## 1                   3         gynecology         2         Emergency
## 2                   4         gynecology         2            Trauma
## 3                   2         gynecology         4         Emergency
## 4                   6         gynecology         2            Trauma
## 5                  11         gynecology         2            Trauma
## 6                   6         gynecology         2            Trauma
## 7                   2         gynecology         2            Trauma
## 8                   7         gynecology         2         Emergency
## 9                   2         gynecology         4         Emergency
## 10                  7         gynecology         4         Emergency
## 11                  2         gynecology         4            Trauma
## 12                  6         anesthesia         2         Emergency
## 13                  1         anesthesia         2            Trauma
## 14                  9         gynecology         2            Urgent
```

```
## 15                  2         gynecology         3            Urgent
## 16                  2         gynecology         3            Urgent
## 17                  6         anesthesia         3         Emergency
## 18                 10         gynecology         2            Trauma
## 19                  6         gynecology         4            Trauma
## 20                  5         gynecology         3            Trauma
## 21                  5         gynecology         2         Emergency
## 22                  6         anesthesia         4            Urgent
## 23                  6         gynecology         3            Urgent
## 24                  6 TB & Chest disease         3            Urgent
## 25                  3         gynecology         2         Emergency
## 26                  6         gynecology         2            Trauma
## 27                 10         gynecology         3            Trauma
## 28                  3         gynecology         2            Trauma
## 29                 13         gynecology         1            Trauma
## 30                  6         gynecology         3         Emergency
## 31                  1         gynecology         1         Emergency
## 32                 11         gynecology         2         Emergency
## 33                  6         gynecology         2         Emergency
## 34                  6         gynecology         3            Trauma
## 35                  7       radiotherapy         2         Emergency
## 36                  1       radiotherapy         2         Emergency
## 37                  1       radiotherapy         3         Emergency
## 38                  7         gynecology         1         Emergency
## 39                  2         gynecology         2            Trauma
## 40                  7       radiotherapy         2         Emergency
##    Severity.of.Illness Visitors.with.Patient Admission_Deposit Total_Deposit
## 1             Moderate                     2              3095       3497.35
## 2             Moderate                     4              4018       4540.34
## 3             Moderate                     3              4492       5075.96
## 4             Moderate                     3              4173       4715.49
## 5             Moderate                     4              4161       4701.93
## 6             Moderate                     2              4659       5264.67
## 7             Moderate                     2              4167       4708.71
## 8             Moderate                     4              3288       3715.44
## 9             Moderate                     4              6818       7704.34
## 10            Moderate                     2              3410       3853.30
## 11            Moderate                     6              4782       5403.66
## 12            Moderate                     4              5357       6053.41
## 13            Moderate                     2              6984       7891.92
## 14            Moderate                     2              5716       6459.08
## 15            Moderate                     6              3410       3853.30
## 16            Moderate                     2              5069       5727.97
## 17            Moderate                     4              4596       5193.48
## 18            Moderate                     6              3933       4444.29
## 19            Moderate                     3              4884       5518.92
## 20            Moderate                     4              5138       5805.94
## 21            Moderate                     6              3753       4240.89
## 22            Moderate                     2              5397       6098.61
## 23            Moderate                     5              3143       3551.59
## 24            Moderate                     4              3839       4338.07
## 25             Extreme                     3              4204       4750.52
## 26             Extreme                     5              4551       5142.63
## 27             Extreme                     3              4000       4520.00
```

```
## 28             Extreme                   3              3570       4034.10
## 29             Extreme                   4              4050       4576.50
## 30               Minor                   2              3090       3491.70
## 31               Minor                   3              4355       4921.15
## 32               Minor                   3              6972       7878.36
## 33               Minor                   7              5349       6044.37
## 34               Minor                   3              4811       5436.43
## 35            Moderate                   2              5426       6131.38
## 36            Moderate                   2              5807       6561.91
## 37            Moderate                   2              5181       5854.53
## 38            Moderate                   4              3772       4262.36
## 39            Moderate                   2              5407       6109.91
## 40            Moderate                   2              5721       6464.73
```

```
# 12/Create a training set using a random number generator engine.

            Hospitals_sample =Used_data %>%
            sample_frac(0.60, replace = FALSE)
            Hospitals_sample
```

```
##    case_id Hospital_code Hospital_type_code City_Code_Hospital
## 1   318459            32                  f                  9
## 2   318467            23                  a                  6
## 3   318478             6                  a                  6
## 4   318484            26                  b                  2
## 5   318472             1                  d                 10
## 6   318439            21                  c                  3
## 7   318442             6                  a                  6
## 8   318443            28                  b                 11
## 9   318479             6                  a                  6
## 10  318471             6                  a                  6
## 11  318483            19                  a                  7
## 12  318460            26                  b                  2
## 13  318469             6                  a                  6
## 14  318466            15                  c                  5
## 15  318461            11                  b                  2
## 16  318468             6                  a                  6
## 17  318474            18                  d                 13
## 18  318463             1                  d                 10
## 19  318441            26                  b                  2
## 20  318454            26                  b                  2
## 21  318475            23                  a                  6
## 22  318444            23                  a                  6
## 23  318476             5                  a                  1
## 24  318465            15                  c                  5
##    Hospital_region_code Available.Extra.Rooms.in.Hospital         Department
## 1                     Y                                2        gynecology
## 2                     X                                4        anesthesia
## 3                     X                                8        gynecology
## 4                     Y                                2        gynecology
## 5                     Y                                5        gynecology
## 6                     Z                                3        gynecology
## 7                     X                                3        gynecology
## 8                     X                                2        gynecology
```

```
## 9                    X                                2         gynecology
## 10                   X                                3         gynecology
## 11                   Y                                6         gynecology
## 12                   Y                                2         gynecology
## 13                   X                                4 TB & Chest disease
## 14                   Z                                6         gynecology
## 15                   Y                                2         gynecology
## 16                   X                                3         gynecology
## 17                   Y                                5         gynecology
## 18                   Y                                3         gynecology
## 19                   Y                                3         gynecology
## 20                   Y                                5         gynecology
## 21                   X                                2         gynecology
## 22                   X                                3         gynecology
## 23                   X                                4         gynecology
## 24                   Z                                4         gynecology
##    Ward_Type Ward_Facility_Code Bed.Grade patientid City_Code_Patient
## 1          S                  B         2     40728                8
## 2          Q                  F         4    128946                7
## 3          Q                  F         2      3199               10
## 4          R                  D         2     10215                8
## 5          Q                  B         3    111851               14
## 6          S                  A         2     17006                2
## 7          Q                  F         2     17006                2
## 8          R                  F         2     17006                2
## 9          R                  F         3      3199               10
## 10         R                  F         2    111851               14
## 11         Q                  C         1     10215                8
## 12         R                  D         3     40728                8
## 13         Q                  F         3    128946                7
## 14         P                  F         2    128946                7
## 15         S                  D         3     40728                8
## 16         Q                  F         3    128946                7
## 17         Q                  B         1    111851               14
## 18         R                  B         2    128946                7
## 19         Q                  D         4     17006                2
## 20         S                  D         4     40728                8
## 21         R                  F         3     71555                1
## 22         Q                  F         2     17006                2
## 23         R                  E         1     71555                1
## 24         P                  F         3    128946                7
##    Type.of.Admission Severity.of.Illness Visitors.with.Patient   Age
## 1             Urgent            Moderate                     2 51-60
## 2             Urgent            Moderate                     2 51-60
## 3          Emergency               Minor                     7 51-60
## 4             Trauma            Moderate                     2 51-60
## 5             Trauma             Extreme                     3 41-50
## 6          Emergency            Moderate                     2 71-80
## 7             Trauma            Moderate                     3 71-80
## 8             Trauma            Moderate                     4 71-80
## 9             Trauma               Minor                     3 51-60
## 10            Trauma             Extreme                     5 41-50
## 11         Emergency            Moderate                     4 51-60
## 12            Urgent            Moderate                     6 51-60
```

```
## 13            Urgent            Moderate                    4 51-60
## 14         Emergency            Moderate                    6 51-60
## 15            Urgent            Moderate                    2 51-60
## 16            Urgent            Moderate                    5 51-60
## 17            Trauma             Extreme                    4 41-50
## 18            Trauma            Moderate                    6 51-60
## 19         Emergency            Moderate                    3 71-80
## 20         Emergency            Moderate                    4 51-60
## 21         Emergency               Minor                    2 41-50
## 22            Trauma            Moderate                    2 71-80
## 23         Emergency               Minor                    3 41-50
## 24            Trauma            Moderate                    4 51-60
##    Admission_Deposit
## 1               5716
## 2               5397
## 3               5349
## 4               5407
## 5               4000
## 6               3095
## 7               4173
## 8               4161
## 9               4811
## 10              4551
## 11              3772
## 12              3410
## 13              3839
## 14              3753
## 15              5069
## 16              3143
## 17              4050
## 18              3933
## 19              4492
## 20              6818
## 21              3090
## 22              4659
## 23              4355
## 24              5138
```

```
# 13/   Print the summary statistics of your dataset.

              summary(Hospitals_clean)
```

```
##     case_id       Hospital_code   Hospital_type_code City_Code_Hospital
##  Min.   :318439   Min.   : 1.00   Length:134865      Min.   : 1.000
##  1st Qu.:352489   1st Qu.:11.00   Class :character   1st Qu.: 2.000
##  Median :386814   Median :19.00   Mode  :character   Median : 5.000
##  Mean   :386831   Mean   :18.34                      Mean   : 4.765
##  3rd Qu.:421088   3rd Qu.:26.00                      3rd Qu.: 7.000
##  Max.   :455495   Max.   :32.00                      Max.   :13.000
##  Hospital_region_code Available.Extra.Rooms.in.Hospital  Department
##  Length:134865        Min.   : 0.000                    Length:134865
##  Class :character     1st Qu.: 2.000                    Class :character
##  Mode  :character     Median : 3.000                    Mode  :character
##                       Mean   : 3.192
```

```
##                       3rd Qu.: 4.000
##                       Max.   :21.000
##   Ward_Type          Ward_Facility_Code   Bed.Grade       patientid
##  Length:134865      Length:134865      Min.   :1.000   Min.   :     3
##  Class :character   Class :character   1st Qu.:2.000   1st Qu.: 33002
##  Mode  :character   Mode  :character   Median :3.000   Median : 65798
##                                        Mean   :2.631   Mean   : 65901
##                                        3rd Qu.:3.000   3rd Qu.: 98852
##                                        Max.   :4.000   Max.   :131618
##  City_Code_Patient Type.of.Admission  Severity.of.Illness Visitors.with.Patient
##  Min.   : 1.000    Length:134865      Length:134865       Min.   : 0.000
##  1st Qu.: 4.000    Class :character   Class :character    1st Qu.: 2.000
##  Median : 8.000    Mode  :character   Mode  :character    Median : 3.000
##  Mean   : 7.244                                           Mean   : 3.278
##  3rd Qu.: 8.000                                           3rd Qu.: 4.000
##  Max.   :38.000                                           Max.   :32.000
##      Age             Admission_Deposit
##  Length:134865      Min.   : 1800
##  Class :character   1st Qu.: 4180
##  Mode  :character   Median : 4732
##                     Mean   : 4871
##                     3rd Qu.: 5398
##                     Max.   :11920
```

```
# 14/   Use any of the numerical variables from the dataset and perform the following statistical funct

            library(tidyverse)
             Result <- as.numeric(Hospitals_clean$Admission_Deposit)

  #  Mean
               result.mean <- mean(Result)
               print(result.mean)
```

```
## [1] 4870.696
```

```
 # Median
               median.result <- median(Result)
               print(median.result)
```

```
## [1] 4732
```

```
#Range
               result.Range <- range(Result)
               print(result.Range)
```

```
## [1]  1800 11920
```

```
# Mode
##=== R does not have a built-in function to calculate the mode of a dataset, but you can use the follo


            library(poliscidata)
```

```
## Registered S3 method overwritten by 'gdata':
##   method         from
##   reorder.factor gplots
```

```
result_mode <- Result
   wtd.mode(result_mode)
```

```
## [1] "4465"
```

```
# 17/   Find the correlation between any 2 variables by applying least square linear regression model.

#  The Relation between the response (dependent) variable and predictor (independent) variable

          H_Corr<-Used_data %>%
              select( City_Code_Hospital, Available.Extra.Rooms.in.Hospital,Hospital_code)

             head(H_Corr, n=30)
```

```
##    City_Code_Hospital Available.Extra.Rooms.in.Hospital Hospital_code
## 1                   3                                3            21
## 2                   4                                2            29
## 3                   2                                3            26
## 4                   6                                3             6
## 5                  11                                2            28
## 6                   6                                3            23
## 7                   2                                2            26
## 8                   7                                1            19
## 9                   2                                5            26
## 10                  7                                2            19
## 11                  2                                3            26
## 12                  6                                4            23
## 13                  1                                2            25
## 14                  9                                2            32
## 15                  2                                2            26
## 16                  2                                2            11
## 17                  6                                2             6
## 18                 10                                3             1
## 19                  6                                2             6
## 20                  5                                4            15
## 21                  5                                6            15
## 22                  6                                4            23
## 23                  6                                3             6
## 24                  6                                4             6
## 25                  3                                4            31
## 26                  6                                3             6
## 27                 10                                5             1
## 28                  3                                6             3
## 29                 13                                5            18
## 30                  6                                2            23
```

```
cor(H_Corr$City_Code_Hospital, H_Corr$Available.Extra.Rooms.in.Hospital,
    use ="complete.obs" )
```

```
## [1] 0.1146128
```

Including Plots

You can also embed plots, for example:

```
##    case_id Hospital_code Hospital_type_code City_Code_Hospital
## 1   318439            21                  c                  3
## 2   318440            29                  a                  4
## 3   318441            26                  b                  2
## 4   318442             6                  a                  6
## 5   318443            28                  b                 11
## 6   318444            23                  a                  6
## 7   318445            26                  b                  2
## 8   318453            19                  a                  7
## 9   318454            26                  b                  2
## 10  318455            19                  a                  7
## 11  318456            26                  b                  2
## 12  318457            23                  a                  6
## 13  318458            25                  e                  1
## 14  318459            32                  f                  9
## 15  318460            26                  b                  2
## 16  318461            11                  b                  2
## 17  318462             6                  a                  6
## 18  318463             1                  d                 10
## 19  318464             6                  a                  6
## 20  318465            15                  c                  5
## 21  318466            15                  c                  5
## 22  318467            23                  a                  6
## 23  318468             6                  a                  6
## 24  318469             6                  a                  6
## 25  318470            31                  c                  3
## 26  318471             6                  a                  6
## 27  318472             1                  d                 10
## 28  318473             3                  c                  3
## 29  318474            18                  d                 13
## 30  318475            23                  a                  6
## 31  318476             5                  a                  1
## 32  318477            28                  b                 11
## 33  318478             6                  a                  6
## 34  318479             6                  a                  6
## 35  318480            27                  a                  7
## 36  318481            10                  e                  1
## 37  318482            25                  e                  1
## 38  318483            19                  a                  7
## 39  318484            26                  b                  2
## 40  318485            27                  a                  7
##    Hospital_region_code Available.Extra.Rooms.in.Hospital         Department
## 1                     Z                                3        gynecology
## 2                     X                                2        gynecology
## 3                     Y                                3        gynecology
## 4                     X                                3        gynecology
## 5                     X                                2        gynecology
## 6                     X                                3        gynecology
## 7                     Y                                2        gynecology
## 8                     Y                                1        gynecology
```

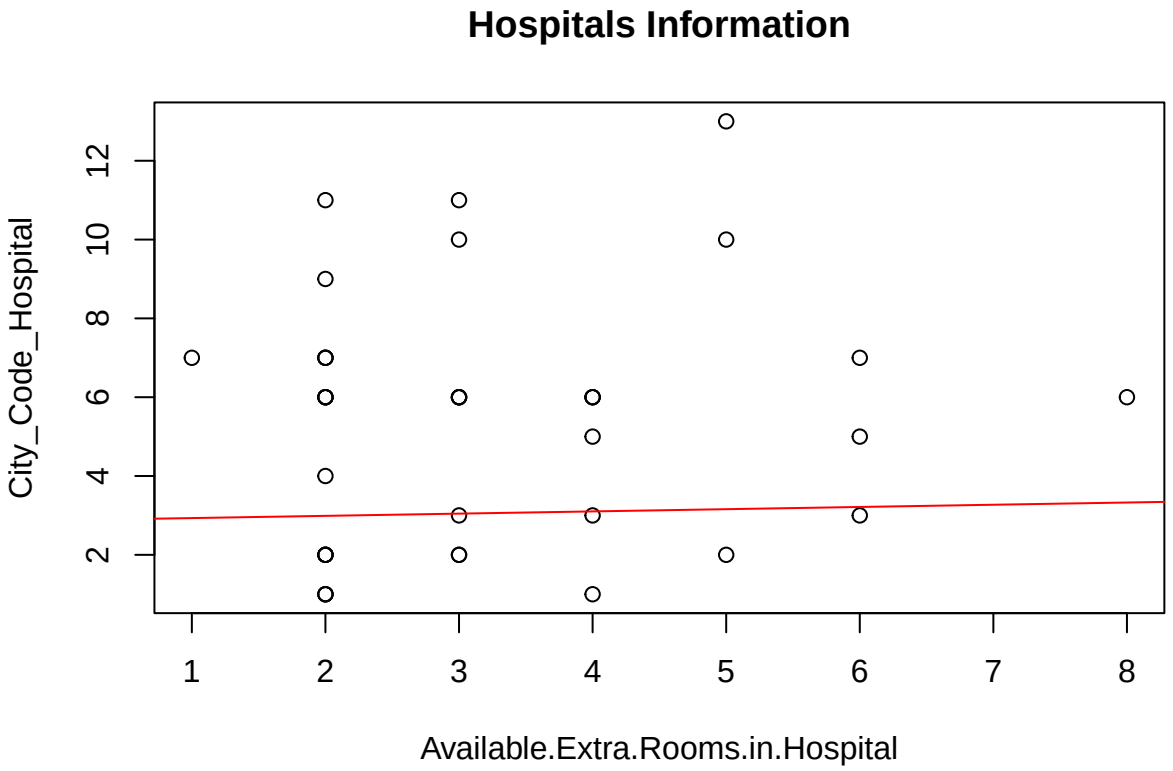
```
## 9                    Y                                5         gynecology
## 10                   Y                                2         gynecology
## 11                   Y                                3         gynecology
## 12                   X                                4         anesthesia
## 13                   X                                2         anesthesia
## 14                   Y                                2         gynecology
## 15                   Y                                2         gynecology
## 16                   Y                                2         gynecology
## 17                   X                                2         anesthesia
## 18                   Y                                3         gynecology
## 19                   X                                2         gynecology
## 20                   Z                                4         gynecology
## 21                   Z                                6         gynecology
## 22                   X                                4         anesthesia
## 23                   X                                3         gynecology
## 24                   X                                4 TB & Chest disease
## 25                   Z                                4         gynecology
## 26                   X                                3         gynecology
## 27                   Y                                5         gynecology
## 28                   Z                                6         gynecology
## 29                   Y                                5         gynecology
## 30                   X                                2         gynecology
## 31                   X                                4         gynecology
## 32                   X                                3         gynecology
## 33                   X                                8         gynecology
## 34                   X                                2         gynecology
## 35                   Y                                2       radiotherapy
## 36                   X                                2       radiotherapy
## 37                   X                                2       radiotherapy
## 38                   Y                                6         gynecology
## 39                   Y                                2         gynecology
## 40                   Y                                2       radiotherapy
##    Ward_Type Ward_Facility_Code Bed.Grade patientid City_Code_Patient
## 1          S                  A         2     17006                 2
## 2          S                  F         2     17006                 2
## 3          Q                  D         4     17006                 2
## 4          Q                  F         2     17006                 2
## 5          R                  F         2     17006                 2
## 6          Q                  F         2     17006                 2
## 7          Q                  D         2     17006                 2
## 8          S                  C         2     40728                 8
## 9          S                  D         4     40728                 8
## 10         S                  C         4     40728                 8
## 11         P                  D         4     40728                 8
## 12         Q                  F         2     40728                 8
## 13         S                  E         2     40728                 8
## 14         S                  B         2     40728                 8
## 15         R                  D         3     40728                 8
## 16         S                  D         3     40728                 8
## 17         R                  F         3    128946                 7
## 18         R                  B         2    128946                 7
## 19         R                  F         4    128946                 7
## 20         P                  F         3    128946                 7
## 21         P                  F         2    128946                 7
```

```
## 22         Q                  F         4    128946                  7
## 23         Q                  F         3    128946                  7
## 24         Q                  F         3    128946                  7
## 25         R                  A         2    111851                 14
## 26         R                  F         2    111851                 14
## 27         Q                  B         3    111851                 14
## 28         Q                  A         2    111851                 14
## 29         Q                  B         1    111851                 14
## 30         R                  F         3     71555                  1
## 31         R                  E         1     71555                  1
## 32         R                  F         2     71555                  1
## 33         Q                  F         2      3199                 10
## 34         R                  F         3      3199                 10
## 35         S                  C         2     10215                  8
## 36         Q                  E         2     10215                  8
## 37         Q                  E         3     10215                  8
## 38         Q                  C         1     10215                  8
## 39         R                  D         2     10215                  8
## 40         S                  C         2     10215                  8
##    Type.of.Admission Severity.of.Illness Visitors.with.Patient   Age
## 1          Emergency            Moderate                     2 71-80
## 2             Trauma            Moderate                     4 71-80
## 3          Emergency            Moderate                     3 71-80
## 4             Trauma            Moderate                     3 71-80
## 5             Trauma            Moderate                     4 71-80
## 6             Trauma            Moderate                     2 71-80
## 7             Trauma            Moderate                     2 71-80
## 8          Emergency            Moderate                     4 51-60
## 9          Emergency            Moderate                     4 51-60
## 10         Emergency            Moderate                     2 51-60
## 11            Trauma            Moderate                     6 51-60
## 12         Emergency            Moderate                     4 51-60
## 13            Trauma            Moderate                     2 51-60
## 14            Urgent            Moderate                     2 51-60
## 15            Urgent            Moderate                     6 51-60
## 16            Urgent            Moderate                     2 51-60
## 17         Emergency            Moderate                     4 51-60
## 18            Trauma            Moderate                     6 51-60
## 19            Trauma            Moderate                     3 51-60
## 20            Trauma            Moderate                     4 51-60
## 21         Emergency            Moderate                     6 51-60
## 22            Urgent            Moderate                     2 51-60
## 23            Urgent            Moderate                     5 51-60
## 24            Urgent            Moderate                     4 51-60
## 25         Emergency             Extreme                     3 41-50
## 26            Trauma             Extreme                     5 41-50
## 27            Trauma             Extreme                     3 41-50
## 28            Trauma             Extreme                     3 41-50
## 29            Trauma             Extreme                     4 41-50
## 30         Emergency               Minor                     2 41-50
## 31         Emergency               Minor                     3 41-50
## 32         Emergency               Minor                     3 41-50
## 33         Emergency               Minor                     7 51-60
## 34            Trauma               Minor                     3 51-60
```

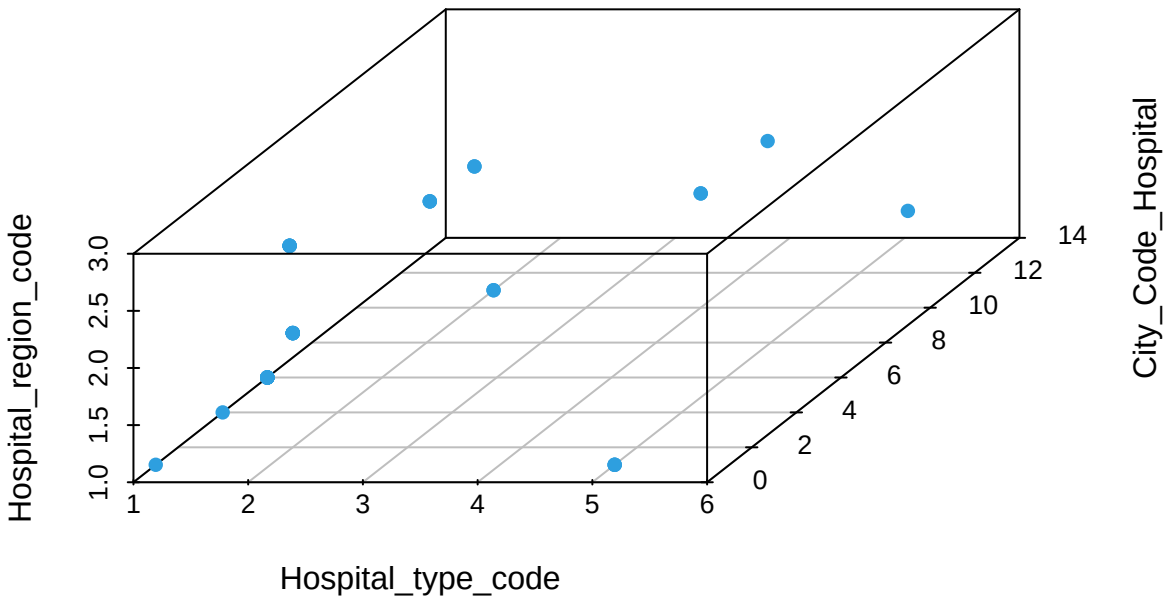
```
## 35         Emergency            Moderate                    2 51-60
## 36         Emergency            Moderate                    2 51-60
## 37         Emergency            Moderate                    2 51-60
## 38         Emergency            Moderate                    4 51-60
## 39            Trauma            Moderate                    2 51-60
## 40         Emergency            Moderate                    2 51-60
##    Admission_Deposit
## 1               3095
## 2               4018
## 3               4492
## 4               4173
## 5               4161
## 6               4659
## 7               4167
## 8               3288
## 9               6818
## 10              3410
## 11              4782
## 12              5357
## 13              6984
## 14              5716
## 15              3410
## 16              5069
## 17              4596
## 18              3933
## 19              4884
## 20              5138
## 21              3753
## 22              5397
## 23              3143
## 24              3839
## 25              4204
## 26              4551
## 27              4000
## 28              3570
## 29              4050
## 30              3090
## 31              4355
## 32              6972
## 33              5349
## 34              4811
## 35              5426
## 36              5807
## 37              5181
## 38              3772
## 39              5407
## 40              5721
```

```r
# 15/Plot a scatter plot for any 2 variables in your data set.

###simple scatter plot


          plot(Used_data$Available.Extra.Rooms.in.Hospital,Used_data$City_Code_Hospital,
```

```
              main= "Hospitals Information", xlab = "Available.Extra.Rooms.in.Hospital",
              ylab = "City_Code_Hospital")
               abline(lm(Used_data$Available.Extra.Rooms.in.Hospital~Used_data$City_Code_Hospital), col
```

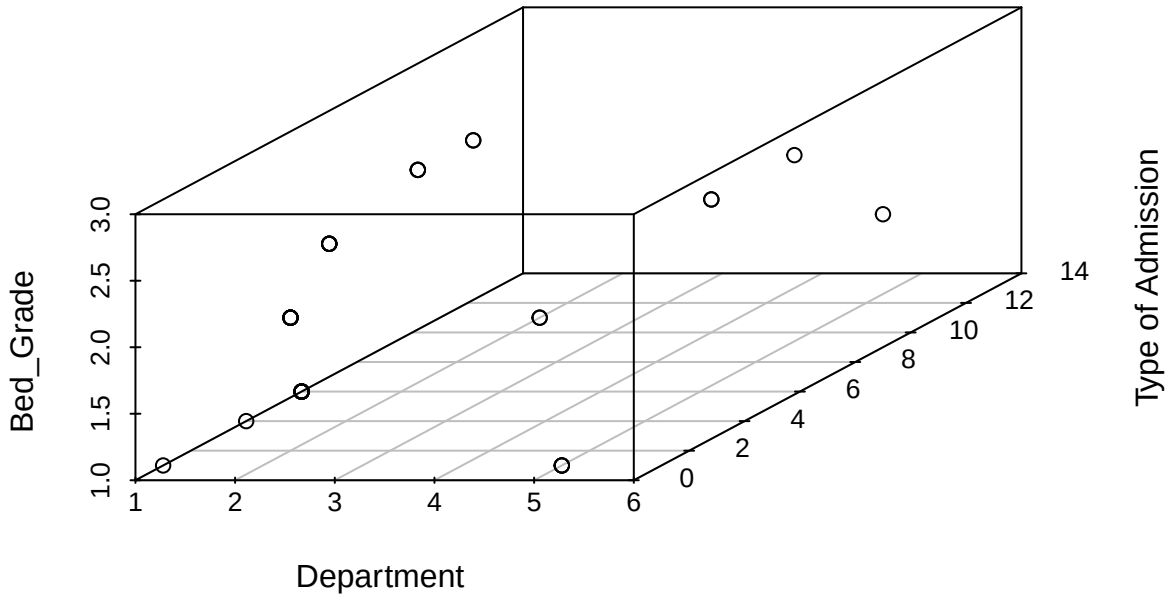



```
### 3D scatter plot

              library(scatterplot3d)

              # Change the angle of point view
              scatterplot3d(Used_data[,3:5], angle = 55, pch = 16, color="#2E9FDF")
```

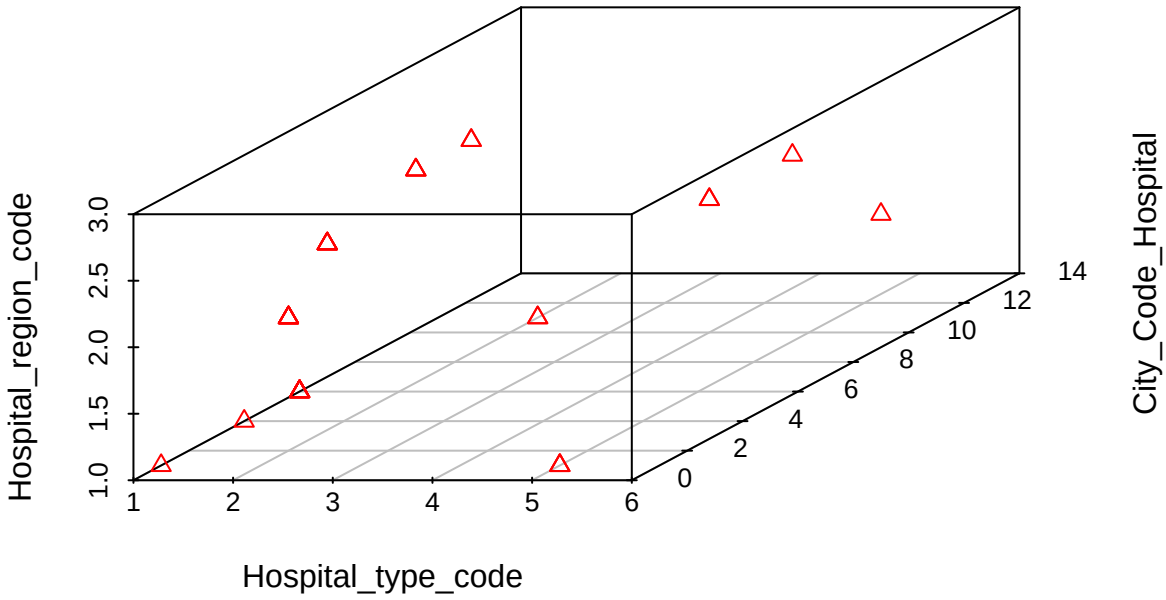



```
#Change the main title and axis labels
scatterplot3d(Used_data[,3:5],
main="Hospital distripution Admission vs Department Vs Bed Grade",
              xlab = "Department ",
              ylab = "Type of Admission ",
              zlab = "Bed_Grade ")
```

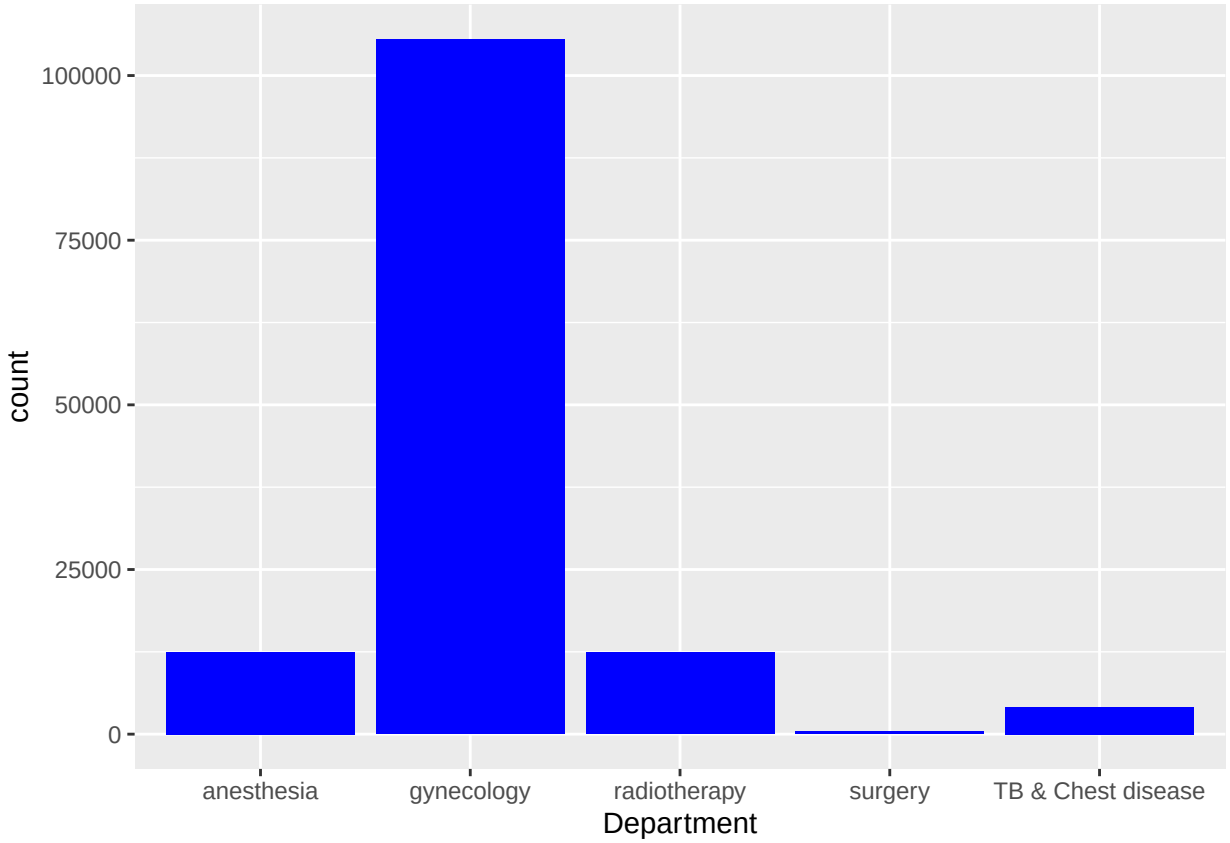
Hospital distripution Admission vs Department Vs Bed Grade



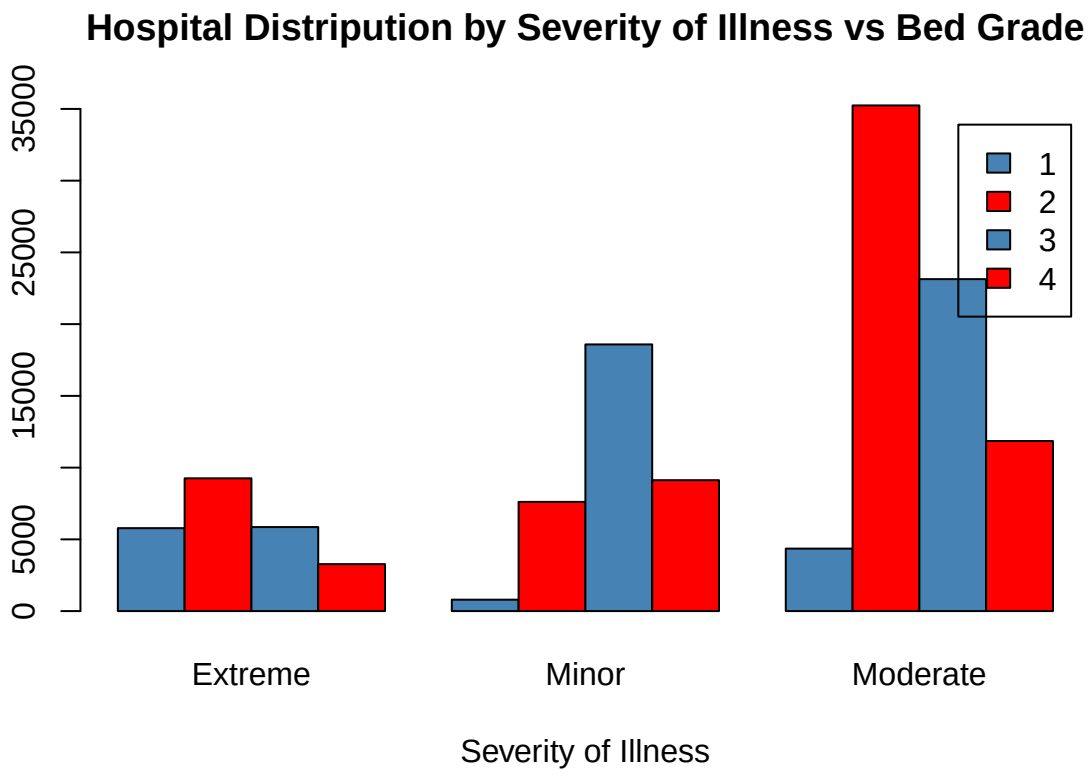

```
#Scatterplot3d - R software and data visualization

#Change the shape and the color of points
scatterplot3d(Used_data[,3:5], pch = 24, color="red")
```



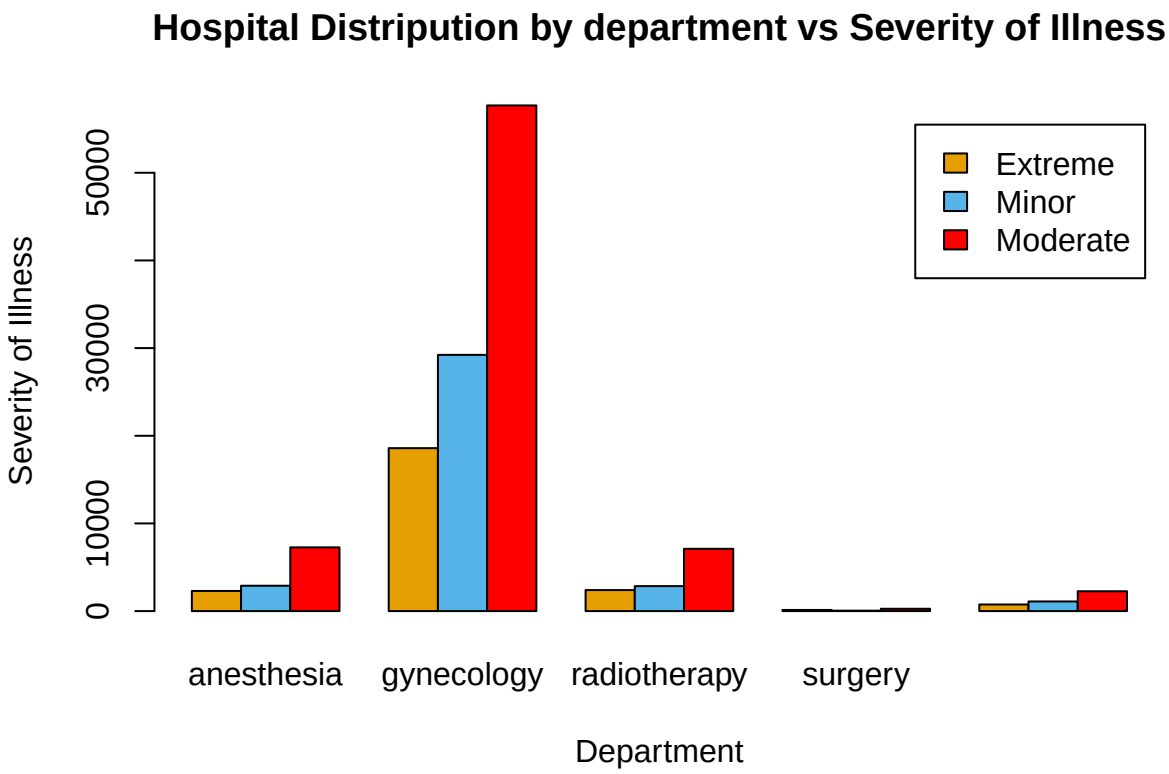

```
    library(ggplot2)
# 16/   Plot a bar plot for any 2 variables in your data set

###Bar plot for one variable

    ggplot(data = Hospitals_clean, aes(x= Department  ))+
     geom_bar(fill = "blue")
```



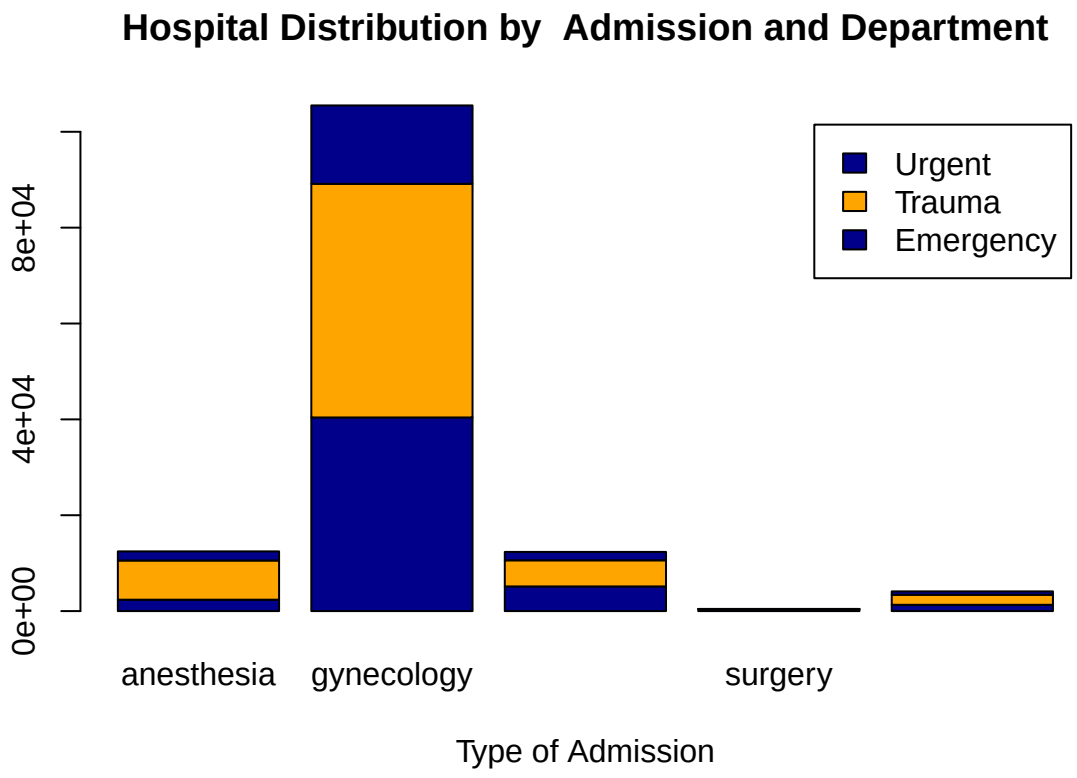

```
###Bar plot for one variable


 ####Bar plot A
library(ggplot2)
        count <- table(Hospitals_clean$Bed.Grade,Hospitals_clean$Severity.of.Illness)
        barplot(count, main= "Hospital Distripution by Severity of Illness vs Bed Grade",
             xlab= "Severity of Illness", col= c("steelblue", "red"),
             legend= rownames(count), beside = TRUE)
```




```
####Bar plot B
      count <- table(Hospitals_clean$Severity.of.Illness,Hospitals_clean$Department)
      barplot(count, main= "Hospital Distripution by department vs Severity of Illness",
                     xlab= "Department",
                     ylab = "Severity of Illness",
                     col= c("#E69F00", "#56B4E9","red" ),
                     legend= rownames(count), beside = TRUE)
```



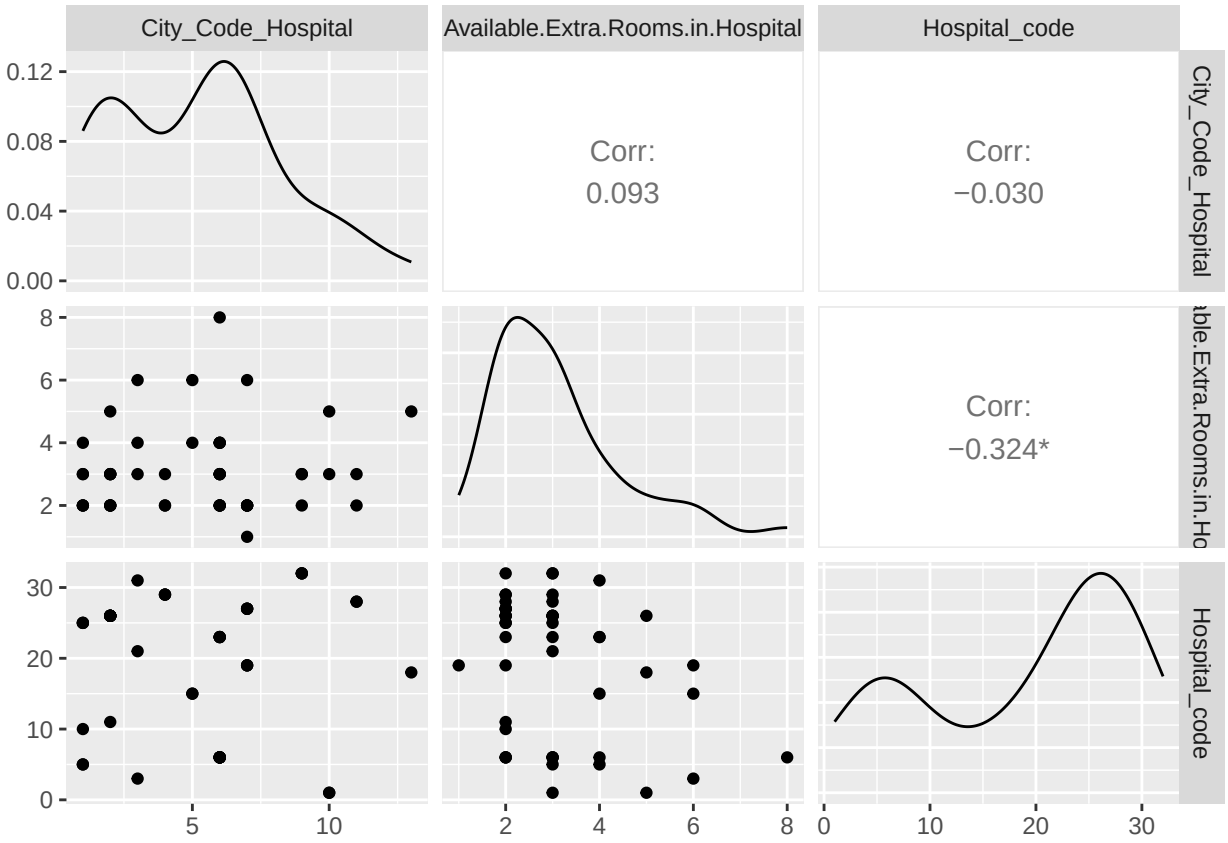

```
# Stacked Bar Plot with Colors and Legend
       counts <- table(Hospitals_clean$Type.of.Admission,Hospitals_clean$Department)
      barplot(counts, main="Hospital Distribution by  Admission and Department",
        xlab="Type of Admission", col=c("darkblue","orange"),
        legend = rownames(counts))
```




```
#17/

      library(GGally)
```

```
## Registered S3 method overwritten by 'GGally':
##   method from
##   +.gg   ggplot2
```

```
                H_Corr<-Hospitals_clean %>%
               select( City_Code_Hospital, Available.Extra.Rooms.in.Hospital,Hospital_code)

               Hospital_Corr<- head(H_Corr,  n=50)

               GGally::ggpairs(Hospital_Corr, columns = 1:3)
```



Note that the `echo = FALSE` parameter was added to the code chunk to prevent printing of the R code that generated the plot.