Assignment 06 - Working with Tidy Data

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1 Assignment

The chart above describes arrival delays for two airlines across five destinations. Your task is to: 1. Create a .CSV file (or optionally, a MySQL database!) that includes all of the information above. You're encouraged to use a "wide" structure similar to how the information appears above, so that you can practice tidying and transformations as described below. 1. Read the information from your .CSV file into R, and use tidyr and dplyr as needed to tidy and transform your data. 1. Perform analysis to compare the arrival delays for the two airlines. 1. Your code should be in an R Markdown file, posted to rpubs.com, and should include narrative descriptions of your data cleanup work, analysis, and conclusions.

2 Solution

2.1 Data Preparation

Let's load a CSV file containing the data and format described above.

```
df <- read.csv("https://raw.githubusercontent.com/himalayahall/DATA607/main/Assignment%2006%20-%20Worki
```

A quick look at the data frame structure shows that the CSV contains two unnamed columns, which have been labeled X and X.1 in the data frame.

```
str(df)
```

```
## 'data.frame':    5 obs. of  7 variables:
##  $ X            : chr  "Alaska" "" "" "AM WEST" ...
##  $ X.1          : chr  "on time" "delayed" "" "on time" ...
##  $ Los.Angeles  : int  497 62 NA 694 117
```

```
##  $ Phoenix      : int  221 12 NA 4840 415
##  $ San.Diego    : int  212 20 NA 383 65
##  $ San.Francisco: int  503 102 NA 320 129
##  $ Seattle      : int  1841 305 NA 201 61
```

Let's rename these columns as *airline* and *arrival_status*, respectively.

```
df <- df %>%
    rename('airline' = 1, 'arrival_status' = 2)
str(df)
```

```
## 'data.frame':    5 obs. of  7 variables:
##  $ airline       : chr  "Alaska" "" "" "AM WEST" ...
##  $ arrival_status: chr  "on time" "delayed" "" "on time" ...
##  $ Los.Angeles   : int  497 62 NA 694 117
##  $ Phoenix       : int  221 12 NA 4840 415
##  $ San.Diego     : int  212 20 NA 383 65
##  $ San.Francisco : int  503 102 NA 320 129
##  $ Seattle       : int  1841 305 NA 201 61
```

Looking at the data, we make two observations: (a) there is an (almost) empty row between the two airlines and (b) airline name is missing on **delayed** rows.

```
head(df)
```

```
##   airline arrival_status Los.Angeles Phoenix San.Diego San.Francisco Seattle
## 1  Alaska        on time         497     221       212           503    1841
## 2                delayed          62      12        20           102     305
## 3                                 NA      NA        NA            NA      NA
## 4 AM WEST        on time         694    4840       383           320     201
## 5                delayed         117     415        65           129      61
```

Based on above data observations, first let's remove the empty.

```
df <- df %>%
            filter(! is.na(arrival_status) &  # remove rows with NA or empty status
                     str_length(arrival_status) > 0)
head(df)
```

```
##   airline arrival_status Los.Angeles Phoenix San.Diego San.Francisco Seattle
## 1  Alaska        on time         497     221       212           503    1841
## 2                delayed          62      12        20           102     305
## 3 AM WEST        on time         694    4840       383           320     201
## 4                delayed         117     415        65           129      61
```

Lastly, let's fill in the airline name on **delayed** rows: replace empty **airline** values with NA and fill in missing values **down** the airline column.

```
df <- df %>%
        mutate(airline = ifelse(airline == "", NA, airline)) %>% # replace empty with NA
        fill(airline, .direction = "down")                       # fill in missing values
head(df)
```

```
##   airline arrival_status Los.Angeles Phoenix San.Diego San.Francisco Seattle
## 1  Alaska        on time         497     221       212           503    1841
## 2  Alaska        delayed          62      12        20           102     305
## 3 AM WEST        on time         694    4840       383           320     201
## 4 AM WEST        delayed         117     415        65           129      61
```

Next, we observe that data frame in a **wide** format. Specifically, destination cities are given as columns. Let's convert this to a **longer** format.

```
df <- df %>%
        pivot_longer(!c("airline", "arrival_status"), # pivot cols EXCEPT airline, arrival_status
                     names_to = "dest",               # col with destination names
                     values_to = "delay_count")       # col with late flight values
head(df)
```

```
## # A tibble: 6 x 4
##   airline arrival_status dest          delay_count
##   <chr>   <chr>          <chr>               <int>
## 1 Alaska  on time        Los.Angeles           497
## 2 Alaska  on time        Phoenix               221
## 3 Alaska  on time        San.Diego             212
## 4 Alaska  on time        San.Francisco         503
## 5 Alaska  on time        Seattle              1841
## 6 Alaska  delayed        Los.Angeles            62
```

2.2 Analysis to compare the arrival delays for the two airlines

Let's extract delayed flight data.

```
delayed_flights <- df %>%
                    filter(df$arrival_status == "delayed")
delayed_flights
```

```
## # A tibble: 10 x 4
##    airline arrival_status dest          delay_count
##    <chr>   <chr>          <chr>               <int>
##  1 Alaska  delayed        Los.Angeles            62
##  2 Alaska  delayed        Phoenix                12
##  3 Alaska  delayed        San.Diego              20
##  4 Alaska  delayed        San.Francisco         102
##  5 Alaska  delayed        Seattle               305
##  6 AM WEST delayed        Los.Angeles           117
##  7 AM WEST delayed        Phoenix               415
##  8 AM WEST delayed        San.Diego              65
##  9 AM WEST delayed        San.Francisco         129
## 10 AM WEST delayed        Seattle                61
```

Let's plot delayed flight data as a histogram. Visual inspection shows that AM WEST has greater number of delayed flights to most destinations compared to Alaska. The one exception destination is Seattle where Alaska has more delayed flights.

```
    ggp <- ggplot(data=delayed_flights, aes(x=dest, y=delay_count, fill=airline))
    ggp <- ggp +  ggtitle('Delayed Flights') + theme(plot.title = element_text(hjust = 0.5))
    ggp <- ggp + geom_text(aes(label=delay_count), vjust=-0.2,
                           position = position_dodge(0.9), size=3.5) +
                           scale_fill_brewer(palette="Paired") +
           geom_bar(stat="identity", position=position_dodge())
ggp
```