

Car Fuel Efficiency Cleaning

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Load in the data

Data from my Subaru Impreza was collected using an OBD reader and was exported into a csv file. The data is exported in monthly blocks so each file needs to be imported separately and then joined to make one big data table.

```
car_10 <- read_csv("driving_2021_10.csv")

## Rows: 37 Columns: 23

## -- Column specification -----
## Delimiter: ","
## chr (14): Driving Start Time, Driving Finish Time, Driving Time, Address, Di...
## dbl (9): Fuel Consumed, Fuel Cost, Rapid Acc. Hard Count, Rapid Acc. Normal...

##
## i Use 'spec()' to retrieve the full column specification for this data.
## i Specify the column types or set 'show_col_types = FALSE' to quiet this message.
```

```
car_11 <- read_csv("driving_2021_11.csv")

## Rows: 57 Columns: 23

## -- Column specification -----
## Delimiter: ","
## chr (14): Driving Start Time, Driving Finish Time, Driving Time, Address, Di...
## dbl (9): Fuel Consumed, Fuel Cost, Rapid Acc. Hard Count, Rapid Acc. Normal...
```

```
##
## i Use 'spec()' to retrieve the full column specification for this data.
## i Specify the column types or set 'show_col_types = FALSE' to quiet this message.
```

```
car_12 <- read_csv("driving_2021_12.csv")
```

```
## Rows: 84 Columns: 23
```

```
## -- Column specification -----
## Delimiter: ","
## chr (14): Driving Start Time, Driving Finish Time, Driving Time, Address, Di...
## dbl (9): Fuel Consumed, Fuel Cost, Rapid Acc. Hard Count, Rapid Acc. Normal...
```

```
##
## i Use 'spec()' to retrieve the full column specification for this data.
## i Specify the column types or set 'show_col_types = FALSE' to quiet this message.
```

Join the Data

We will join all the data together to create one big data table.

```
car <- full_join(car_10, car_11)
```

```
## Joining, by = c("Driving Start Time", "Driving Finish Time", "Driving Time", "Address", "Distance",
```

```
car <- full_join(car, car_12)
```

```
## Joining, by = c("Driving Start Time", "Driving Finish Time", "Driving Time", "Address", "Distance",
```

EDA

Before a model can be constructed, it is important to perform explanatory data analysis (EDA) to ensure that the data is clean and in the correct form and also to investigate relationships between predictors and the response variable.

EDA 01: View the data

To begin with, we will view the data to see what needs to be fixed before working with the data.

```
head(car)

## # A tibble: 6 x 23
##   'Driving Start T~ 'Driving Finish~ 'Driving Time' Address Distance 'Max Speed'
##   <chr>            <chr>            <chr>            <chr>    <chr>    <chr>
## 1 2021.10.19 16:52~ 2021.10.19 16:5~ 6m 48s          22 Win~ 0.75km  42.0km/h
## 2 2021.10.20 19:07~ 2021.10.20 19:2~ 14m 34s          71 Dev~ 8.95km  62.0km/h
## 3 2021.10.20 21:41~ 2021.10.20 21:5~ 12m 8s           22 Win~ 8.75km  64.0km/h
## 4 2021.10.21 19:32~ 2021.10.21 19:4~ 8m 2s            1-9 Be~ 4.54km  60.0km/h
## 5 2021.10.22 07:45~ 2021.10.22 08:2~ 43m 5s           1-15 H~ 17.18km 64.0km/h
## 6 2021.10.22 08:45~ 2021.10.22 09:1~ 27m 43s          119 Be~ 16.08km 66.0km/h
## # ... with 17 more variables: Avr. Speed <chr>, Max RPM <chr>, Avr. RPM <chr>,
## #   Max Coolant Temp <chr>, Max Engine Oil Temp <chr>, Fuel efficiency <chr>,
## #   Fuel Consumed <dbl>, Fuel Cost <dbl>, Rapid Acc. Hard Count <dbl>,
## #   Rapid Acc. Normal Count <dbl>, Rapid Decel. Hard Count <dbl>,
## #   Rapid Decel. Normal Count <dbl>, Speeding Hard count <dbl>,
## #   Speeding Normal count <dbl>, Idling time <dbl>, Safe Driving Score <chr>,
## #   Eco Driving Score <chr>
```

We can omit the missing data points as there are not many of them so omitting them won't have much of an impact on the results.

```
car <- car %>%
  na.omit()
```

EDA 02: Remove predictors

We saw that there were 22 predictors in the data set, however, not all of them are useful for the purpose of the task, so we will omit these predictors from the data set.

```
car <- car %>%
  select(-c(Address, `Driving Start Time`, `Driving Finish Time`, `Max Engine Oil Temp`,
             `Fuel Cost`, `Speeding Normal count`, `Speeding Hard count`,
             `Rapid Acc. Hard Count`, `Rapid Acc. Normal Count`, `Driving Time`))
head(car)
```

```
## # A tibble: 6 x 13
##   Distance 'Max Speed' 'Avr. Speed' 'Max RPM' 'Avr. RPM' 'Max Coolant Temp'
##   <chr>    <chr>        <chr>        <chr>    <chr>    <chr>
## 1 0.75km  42.0km/h    6.66km/h    2346.75rpm 989.55rpm 92.0°C
## 2 8.95km  62.0km/h    37.41km/h    3037.5rpm 1549.8rpm 97.0°C
```

```
## 3 8.75km    64.0km/h    43.28km/h    2684.25rpm 1543.91rpm 97.0°C
## 4 4.54km    60.0km/h    33.93km/h    2775.0rpm 1468.14rpm 96.0°C
## 5 17.18km   64.0km/h    23.94km/h    2693.75rpm 1228.58rpm 98.0°C
## 6 16.08km   66.0km/h    34.82km/h    2634.25rpm 1347.62rpm 98.0°C
## # ... with 7 more variables: Fuel efficiency <chr>, Fuel Consumed <dbl>,
## #   Rapid Decel. Hard Count <dbl>, Rapid Decel. Normal Count <dbl>,
## #   Idling time <dbl>, Safe Driving Score <chr>, Eco Driving Score <chr>
```

EDA 03: Clean columns

We will now clean the columns, converting them into the right form and removing the units of measurement for each data point.

```
# Remove units of measurement
car$Distance <- str_remove_all(car$Distance, "km")
car$`Avr. Speed` <- str_remove_all(car$`Avr. Speed`, "km/h")
car$`Max Speed` <- str_remove_all(car$`Max Speed`, "km/h")
car$`Avr. RPM` <- str_remove_all(car$`Avr. RPM`, "rpm")
car$`Max RPM` <- str_remove_all(car$`Max RPM`, "rpm")
car$`Max Coolant Temp` <- str_remove_all(car$`Max Coolant Temp`, "°C")
car$`Fuel efficiency` <- str_remove_all(car$`Fuel efficiency`, "L/100km")

# Convert to numeric
car$Distance <- as.numeric(car$Distance)
car$`Avr. Speed` <- as.numeric(car$`Avr. Speed`)
car$`Max Speed` <- as.numeric(car$`Max Speed`)
car$`Avr. RPM` <- as.numeric(car$`Avr. RPM`)
car$`Max RPM` <- as.numeric(car$`Max RPM`)
car$`Max Coolant Temp` <- as.numeric(car$`Max Coolant Temp`)
car$`Fuel efficiency` <- as.numeric(car$`Fuel efficiency`)
car$`Safe Driving Score` <- as.numeric(car$`Safe Driving Score`)
```

```
## Warning: NAs introduced by coercion
```

```
car$`Eco Driving Score` <- as.numeric(car$`Eco Driving Score`)
```

```
## Warning: NAs introduced by coercion
```

Viewing the Clean Data

We can see the final clean data below.

```
head(car)

## # A tibble: 6 x 13
##   Distance `Max Speed` `Avr. Speed` `Max RPM` `Avr. RPM` `Max Coolant Temp`
##   <dbl>      <dbl>      <dbl>      <dbl>      <dbl>      <dbl>
## 1    0.75        42        6.66    2347.        990.         92
## 2    8.95        62       37.4    3038.       1550.        97
## 3    8.75        64       43.3    2684.       1544.        97
## 4    4.54        60       33.9    2775.       1468.        96
```

```
## 5      17.2          64      23.9      2694.      1229.          98
## 6      16.1          66      34.8      2634.      1348.          98
## # ... with 7 more variables: Fuel efficiency <dbl>, Fuel Consumed <dbl>,
## #   Rapid Decel. Hard Count <dbl>, Rapid Decel. Normal Count <dbl>,
## #   Idling time <dbl>, Safe Driving Score <dbl>, Eco Driving Score <dbl>
```

Saving the Data

```
filename <- glue::glue("{lubridate::today()}-driving.rds")
saveRDS(car, filename)
```