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Assumptions

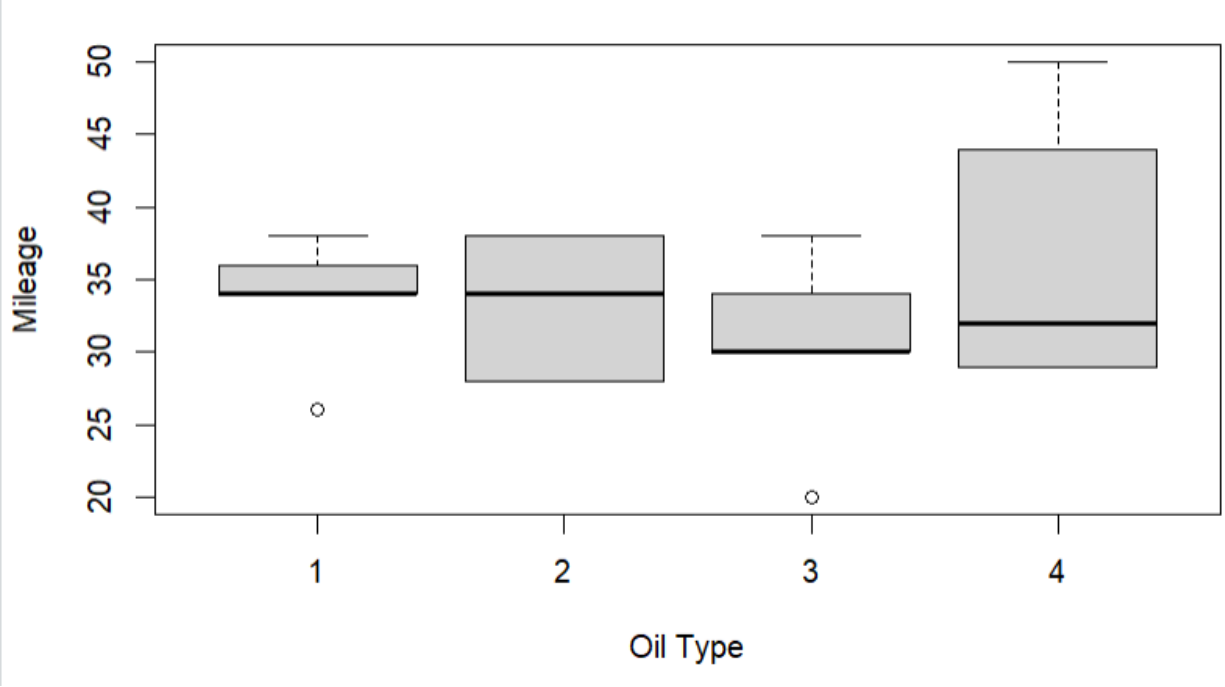
Assumption #1: You have one dependent variable that is measured at the continuous level (i.e., it is measured at the interval or ratio level).

Mileage is the dependent variable.

Assumption #2: You have one within-subjects factor that consists of three or more categorical. levels.

The Independent Variable Oil has 4 levels.

Assumptions #3: There should be no significant outliers in the three or more levels of the within-subjects' factor



There is a significant outlier in the given data.

Assumptions #4: The distribution of the dependent variable in the three or more levels of the within-subjects factor should be approximately normally distributed.

```
## # A tibble: 4 x 2
##   Oil   p_value
##   <fct>   <dbl>
## 1 1       0.228
## 2 2       0.105
## 3 3       0.616
## 4 4       0.147
```

Based on the given data, by Shapiro-Wilk the levels of oil were normally distributed as p > 0.05

Assumptions #5: The variances of the differences between all combinations of levels of the

within-subjects factor must be equal (known as the assumption of sphericity)

```
## $ANOVA
##        Effect DFn DFd   SSn   SSd            F            p p<.05       ges
## 1 (Intercept)   1   4 22445   8.5 1.056235e+04 5.374720e-08     * 0.9683334
## 2         Oil   3  12   103 725.5 5.678842e-01 6.466468e-01       0.1230585
##
## $`Mauchly's Test for Sphericity`
##   Effect         W        p p<.05
## 2    Oil 0.2874098 0.658963
##
## $`Sphericity Corrections`
##   Effect       GGe     p[GG] p[GG]<.05      HFe     p[HF] p[HF]<.05
## 2    Oil 0.6876969 0.5924143           1.431052 0.6466468
```

In this case, both corrections (GGe and HFe) are provided. The p-values for these corrections are not less than 0.05, suggesting that the sphericity corrections do not significantly affect the results. Thus, it is not violated (assumption of sphericity).

Report:

To determine the significance in mileage of cars between four engine oils., one-way repeated measures ANOVA was used. By the given boxplot and Shapiro-Wilk test (p >0.05), there was a significant outlier, and the data is normally distributed. With the use of Maulchy's test of sphericity, which yielded a p-value of 0.658, the sphericity assumption was not broken. Hence, there is no significant difference between the milage of cars and oils.

GITHUB LINK: https://github.com/justinlorence12/SA2_OILS