2-way ANOVA

FMU Biology Department

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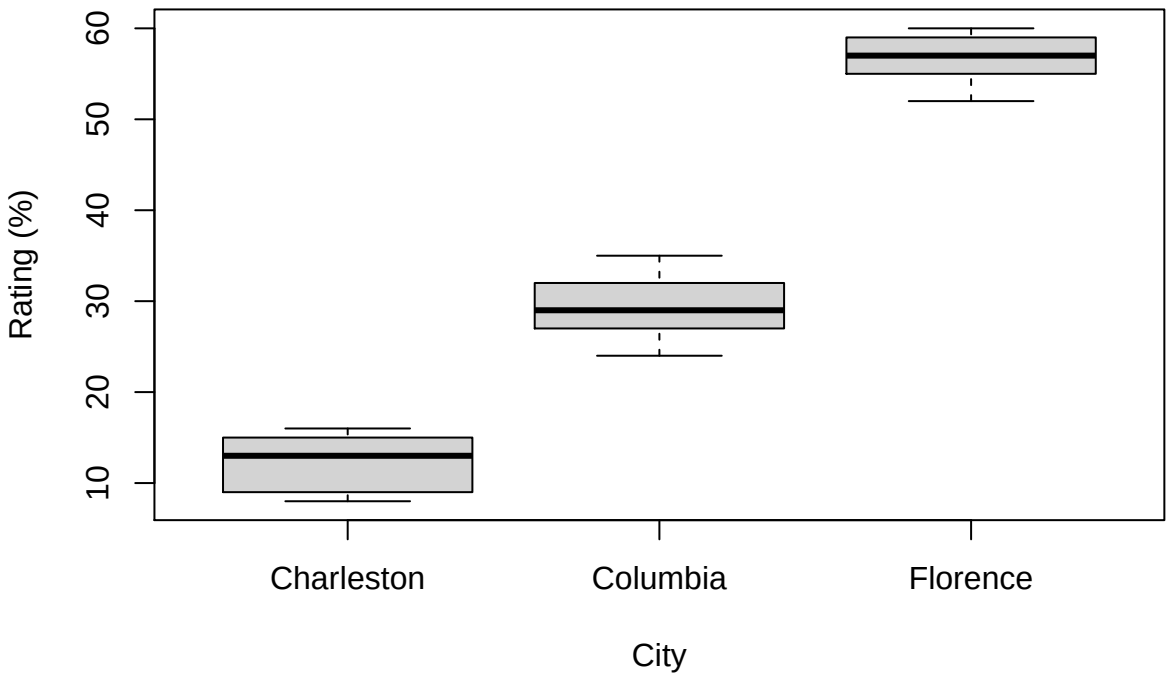
Analysis

This documents includes code for creating a data object in R, creating an informative plot, and running an 2-way Analysis of Variance (ANOVA).

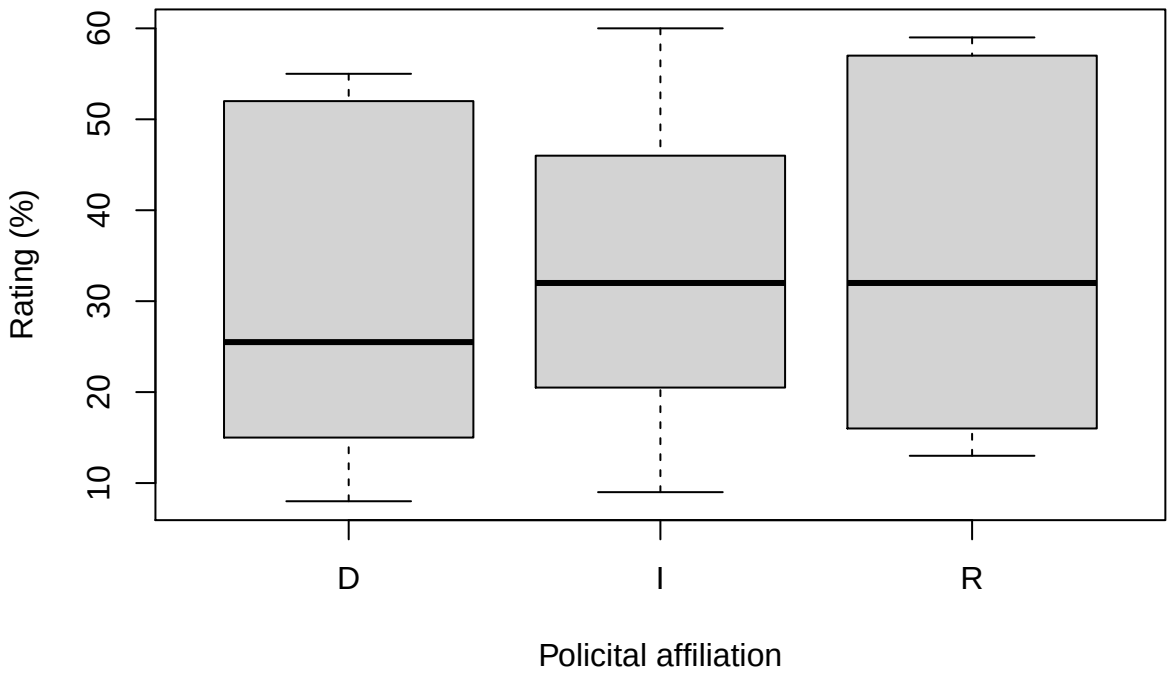
```
#Create data frame
dat1 = data.frame(rating = c(13,16,8,15,9,
                             29,35,24,27,32,
                             57,59,52,55,60),
                  city = c("Charleston","Charleston","Charleston","Charleston","Charleston",
                           "Columbia","Columbia","Columbia","Columbia","Columbia",
                           "Florence","Florence","Florence","Florence","Florence"),
                  politics = c("R","R","D","D","I",
                           "R","R","D","D","I",
                           "R","R","D","D","I"))

#Print data frame
dat1
```

```
##    rating       city politics
## 1      13 Charleston        R
## 2      16 Charleston        R
## 3       8 Charleston        D
## 4      15 Charleston        D
## 5       9 Charleston        I
## 6      29   Columbia        R
## 7      35   Columbia        R
## 8      24   Columbia        D
## 9      27   Columbia        D
## 10     32   Columbia        I
## 11     57   Florence        R
## 12     59   Florence        R
## 13     52   Florence        D
## 14     55   Florence        D
## 15     60   Florence        I
```

```
#Create Boxplot
boxplot(dat1$rating~dat1$city,
        ylab = "Rating (%)", xlab = "City")
```




```
#Create Boxplot
boxplot(dat1$rating~dat1$politics,
        ylab = "Rating (%)", xlab = "Policital affiliation")
```




```
#ANOVA
res = aov(dat1$rating~dat1$city * dat1$politics)
#Display ANOVA results
summary(res)
```

```
##                         Df Sum Sq Mean Sq F value  Pr(>F)
## dat1$city                2   5012  2505.9 259.228 1.5e-06 ***
## dat1$politics            2     69    34.3   3.548  0.0962 .
## dat1$city:dat1$politics  4     39     9.6   0.998  0.4759
## Residuals                6     58     9.7
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
#Tukey post-hoc comparisons
TukeyHSD(res)
```

```
##   Tukey multiple comparisons of means
##     95% family-wise confidence level
##
## Fit: aov(formula = dat1$rating ~ dat1$city * dat1$politics)
##
## $`dat1$city`
##                       diff      lwr      upr     p adj
## Columbia-Charleston 17.2 11.16659 23.23341 0.0003036
## Florence-Charleston 44.4 38.36659 50.43341 0.0000013
## Florence-Columbia   27.2 21.16659 33.23341 0.0000217
##
```

```
## $`dat1$politics`
##         diff        lwr      upr     p adj
## I-D 3.500000 -3.2455532 10.24555 0.3189666
## R-D 4.666667 -0.8410545 10.17439 0.0899164
## R-I 1.166667 -5.5788866  7.91222 0.8596204
##
## $`dat1$city:dat1$politics`
##                                     diff         lwr         upr     p adj
## Columbia:D-Charleston:D    1.400000e+01   0.1073131  27.8926869 0.0483445
## Florence:D-Charleston:D    4.200000e+01  28.1073131  55.8926869 0.0001492
## Charleston:I-Charleston:D -2.500000e+00 -19.5149971  14.5149971 0.9977692
## Columbia:I-Charleston:D    2.050000e+01   3.4850029  37.5149971 0.0212615
## Florence:I-Charleston:D    4.850000e+01  31.4850029  65.5149971 0.0002077
## Charleston:R-Charleston:D  3.000000e+00 -10.8926869  16.8926869 0.9767291
## Columbia:R-Charleston:D    2.050000e+01   6.6073131  34.3926869 0.0077410
## Florence:R-Charleston:D    4.650000e+01  32.6073131  60.3926869 0.0000834
## Florence:D-Columbia:D      2.800000e+01  14.1073131  41.8926869 0.0014579
## Charleston:I-Columbia:D   -1.650000e+01 -33.5149971   0.5149971 0.0571095
## Columbia:I-Columbia:D      6.500000e+00 -10.5149971  23.5149971 0.7302962
## Florence:I-Columbia:D      3.450000e+01  17.4850029  51.5149971 0.0014101
## Charleston:R-Columbia:D   -1.100000e+01 -24.8926869   2.8926869 0.1283358
## Columbia:R-Columbia:D      6.500000e+00  -7.3926869  20.3926869 0.5452766
## Florence:R-Columbia:D      3.250000e+01  18.6073131  46.3926869 0.0006337
## Charleston:I-Florence:D   -4.450000e+01 -61.5149971 -27.4850029 0.0003373
## Columbia:I-Florence:D     -2.150000e+01 -38.5149971  -4.4850029 0.0168815
## Florence:I-Florence:D      6.500000e+00 -10.5149971  23.5149971 0.7302962
## Charleston:R-Florence:D   -3.900000e+01 -52.8926869 -25.1073131 0.0002263
## Columbia:R-Florence:D     -2.150000e+01 -35.3926869  -7.6073131 0.0060460
## Florence:R-Florence:D      4.500000e+00  -9.3926869  18.3926869 0.8461629
## Columbia:I-Charleston:I    2.300000e+01   3.3527737  42.6472263 0.0243864
## Florence:I-Charleston:I    5.100000e+01  31.3527737  70.6472263 0.0003519
## Charleston:R-Charleston:I  5.500000e+00 -11.5149971  22.5149971 0.8473585
## Columbia:R-Charleston:I    2.300000e+01   5.9850029  40.0149971 0.0120885
## Florence:R-Charleston:I    4.900000e+01  31.9850029  66.0149971 0.0001960
## Florence:I-Columbia:I      2.800000e+01   8.3527737  47.6472263 0.0092527
## Charleston:R-Columbia:I   -1.750000e+01 -34.5149971  -0.4850029 0.0441816
## Columbia:R-Columbia:I     -3.552714e-15 -17.0149971  17.0149971 1.0000000
## Florence:R-Columbia:I      2.600000e+01   8.9850029  43.0149971 0.0064595
## Charleston:R-Florence:I   -4.550000e+01 -62.5149971 -28.4850029 0.0002975
## Columbia:R-Florence:I     -2.800000e+01 -45.0149971 -10.9850029 0.0043756
## Florence:R-Florence:I     -2.000000e+00 -19.0149971  15.0149971 0.9995168
## Columbia:R-Charleston:R    1.750000e+01   3.6073131  31.3926869 0.0171408
## Florence:R-Charleston:R    4.350000e+01  29.6073131  57.3926869 0.0001224
## Florence:R-Columbia:R      2.600000e+01  12.1073131  39.8926869 0.0021900
```