ANOVAs pro Gui

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```
# carregando os pacotes ------------------------------------------------

lista_de_pacotes  <- c("tidyverse",
                       "readxl",
                       "here",
                       "lme4",
                       "janitor",
                       "ggbeeswarm",
                       "broom",
                       "tufte",
                       "ggthemes",
                       "ggpol")


pacotes_novos <-
  lista_de_pacotes[!(lista_de_pacotes %in% installed.packages()[, "Package"])]
if (length(pacotes_novos))
  install.packages(pacotes_novos)


library(tidyverse)
library(readxl)
library(here)
library(lme4)
library(janitor)
library(ggbeeswarm)
library(broom)
library(ggthemes)
library(ggpol)
```

Carregando os dados

```
micro <-
  read_xls(here("dados","Stat-microrrugosidade.xls")) %>%
  clean_names() %>%
  mutate_at(.vars = vars(sp:rep), .funs = ~ factor(.))

micro_m1 <- lm(sq ~ sp*face, data = micro)

anova(micro_m1)
```

```
## Analysis of Variance Table
##
## Response: sq
##           Df Sum Sq Mean Sq F value    Pr(>F)
## sp         1 158961  158961 92.4622 1.136e-05 ***
## face       1   1046    1046  0.6083    0.4579
## sp:face    1   4941    4941  2.8741    0.1285
## Residuals  8  13754    1719
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
micro_m2 <- update(micro_m1, . ~ . - sp:face)

anova(micro_m2)
```

```
## Analysis of Variance Table
##
## Response: sq
##           Df Sum Sq Mean Sq F value    Pr(>F)
## sp         1 158961  158961 76.5266 1.077e-05 ***
## face       1   1046    1046  0.5034     0.496
## Residuals  9  18695    2077
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
anova(micro_m1)
```

```
## Analysis of Variance Table
##
## Response: sq
##           Df Sum Sq Mean Sq F value    Pr(>F)
## sp         1 158961  158961 92.4622 1.136e-05 ***
## face       1   1046    1046  0.6083    0.4579
## sp:face    1   4941    4941  2.8741    0.1285
## Residuals  8  13754    1719
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
TukeyHSD(aov(micro_m1))
```

```
##   Tukey multiple comparisons of means
##     95% family-wise confidence level
##
## Fit: aov(formula = micro_m1)
##
## $sp
##        diff     lwr      upr    p adj
## 2-1 230.189 174.986 285.3919 1.14e-05
##
## $face
##         diff       lwr      upr     p adj
## 2-1 -18.6703 -73.87328 36.53267 0.4578902
```

```
##
## $`sp:face`
##                diff        lwr        upr     p adj
## 2:1-1:1  270.77301  162.35873  379.18728 0.0002015
## 1:2-1:1   21.91374  -86.50054  130.32802 0.9135876
## 2:2-1:1  211.51866  103.10438  319.93294 0.0011122
## 1:2-2:1 -248.85927 -357.27355 -140.44499 0.0003659
## 2:2-2:1  -59.25434 -167.66862   49.15993 0.3607959
## 2:2-1:2  189.60492   81.19064  298.01920 0.0022748
```

```
macro <- read_xls(here("dados", "Stat-macrorrugosidade.xls")) %>%
  clean_names() %>%
  mutate_at(.vars = vars(sp:rep), .funs = ~ factor(.))

# macro_m1 <- lm()
```

ANOVA ui

```
ui %>%
  group_by(sp, face) %>%
  summarise(avg = mean(ui),
            sd = sd(ui))
```

```
## # A tibble: 4 x 4
## # Groups:   sp [2]
##   sp    face    avg     sd
##   <fct> <fct> <dbl>  <dbl>
## 1 1     1      1.25 0.0187
## 2 1     2      1.20 0.0143
## 3 2     1      1.81 0.0888
## 4 2     2      1.84 0.0981
```

Código

```
ui_m1 <- lm(ui ~ sp * face, data = ui)

anova(ui_m1)

(TukeyHSD(aov(ui_m1)))

# ui_m2 <- update(ui_m1, . ~ . -sp:face)
#
# anova(ui_m2) %>%
#   rename(`P value` = `Pr(>F)`)
```

Tabela ANOVA ui

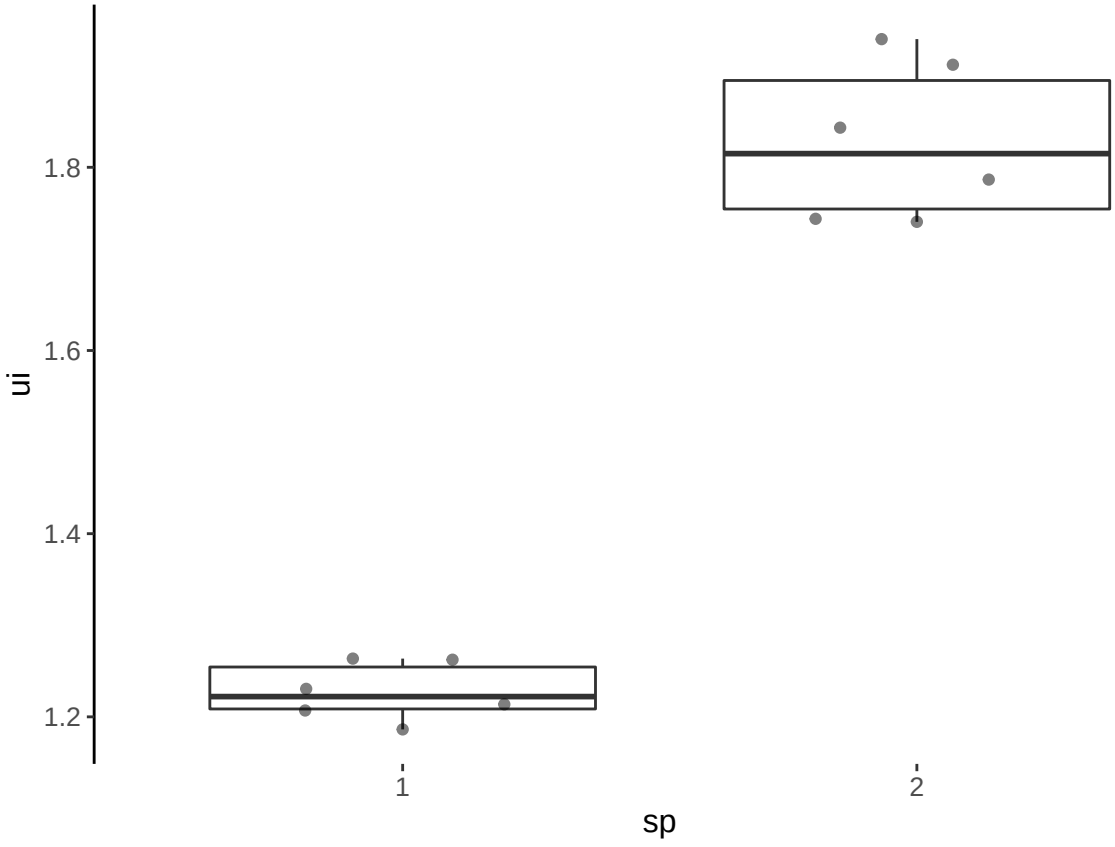
```r
anova(ui_m1) %>%
  rename(`P value` = `Pr(>F)`) %>%
  knitr::kable(digits = 3)
```

	Df	Sum Sq	Mean Sq	F value	P value
sp	1	1.082	1.082	239.627	0.000
face	1	0.000	0.000	0.070	0.798
sp:face	1	0.005	0.005	1.042	0.337
Residuals	8	0.036	0.005	NA	NA

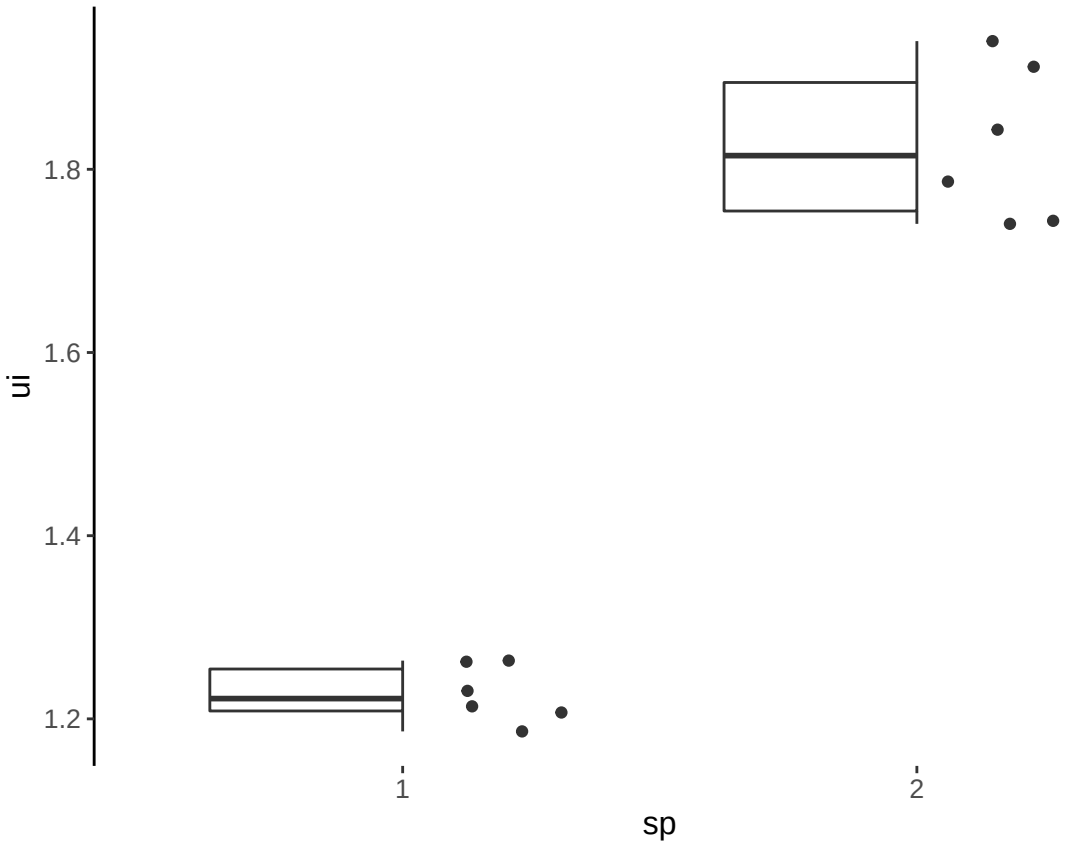
Gráfico

Os dois gráficos abaixo tem as mesmas informações, escolha o que mais lhe agradar.

```r
ui %>%
  ggplot(aes(x = sp, y = ui)) +
  geom_boxplot() +
  geom_quasirandom(groupOnX = T,
                   alpha = .5) +
  theme_classic() +
  theme(axis.line.x = element_blank(),
        text = element_text(size = 12))
```



```
ui %>%
  ggplot(aes(x = sp, y = ui)) +
  geom_boxjitter(jitter.height = 0) +
  theme_classic() +
  theme(axis.line.x = element_blank(),
        text = element_text(size = 12))
```



Tukey

ANOVA angle

```
angle %>%
  group_by(sp, face) %>%
  summarise(avg = mean(angle),
            sd = sd(angle))
```

```
## # A tibble: 4 x 4
## # Groups:   sp [2]
##   sp    face    avg    sd
##   <fct> <fct> <dbl> <dbl>
## 1 1     1      78.4  7.66
## 2 1     2      81.8  2.43
```

```
## 3 2     1     142.   2.69
## 4 2     2     144.   4.16
```

Código

```r
angle_m1 <- lm(angle ~ sp*face, data = angle)

anova(angle_m1)

(TukeyHSD(aov(angle_m1)))

# angle_m2 <- update(angle_m1, . ~ . - sp:face)
#
# anova(angle_m1, angle_m2)
#
# anova(angle_m2)
```

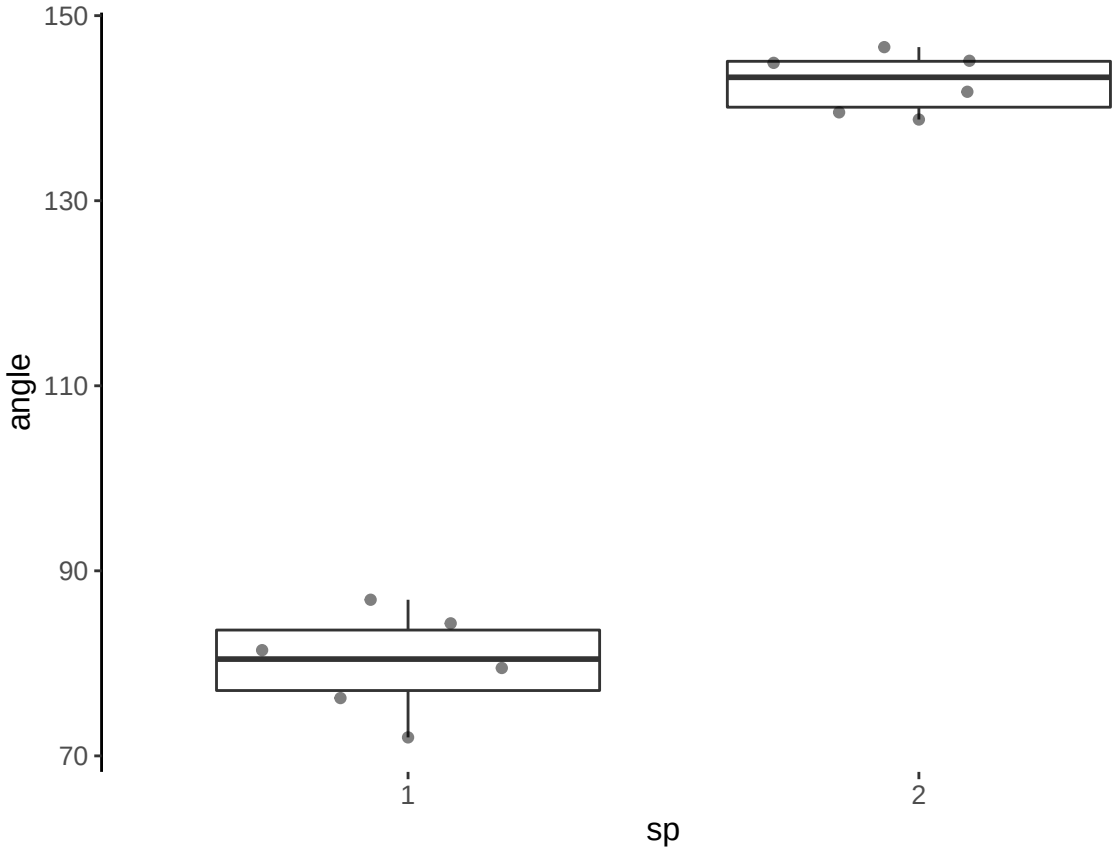
Tabela

	Df	Sum Sq	Mean Sq	F value	P value
sp	1	11803.277	11803.277	529.807	0.000
face	1	17.280	17.280	0.776	0.404
sp:face	1	2.852	2.852	0.128	0.730
Residuals	8	178.227	22.278	NA	NA

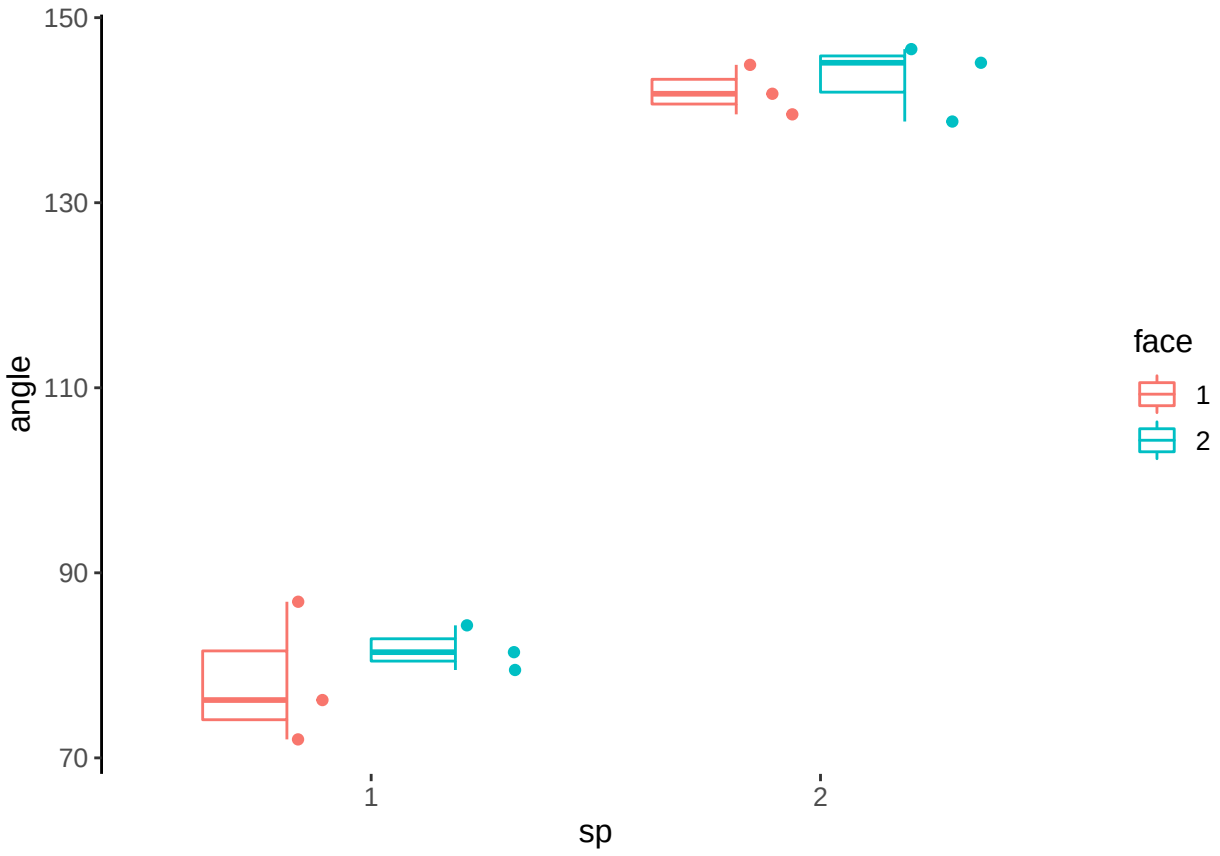
Gráfico

Os dois gráficos abaixo tem as mesmas informções, escolha o que mais lhe agradar.

```r
angle %>%
  ggplot(aes(x = sp, y = angle)) +
  geom_boxplot() +
  geom_quasirandom(groupOnX = T,
                   alpha = .5) +
  theme_classic() +
  theme(axis.line.x = element_blank(),
        text = element_text(size = 12))
```




```
angle %>%
  ggplot(aes(x = sp, y = angle, color = face)) +
  geom_boxjitter(jitter.height = 0) +
  theme_classic() +
  theme(axis.line.x = element_blank(),
        text = element_text(size = 12))
```


150
130
110
90
70
angle
1
2
sp
face
1
2