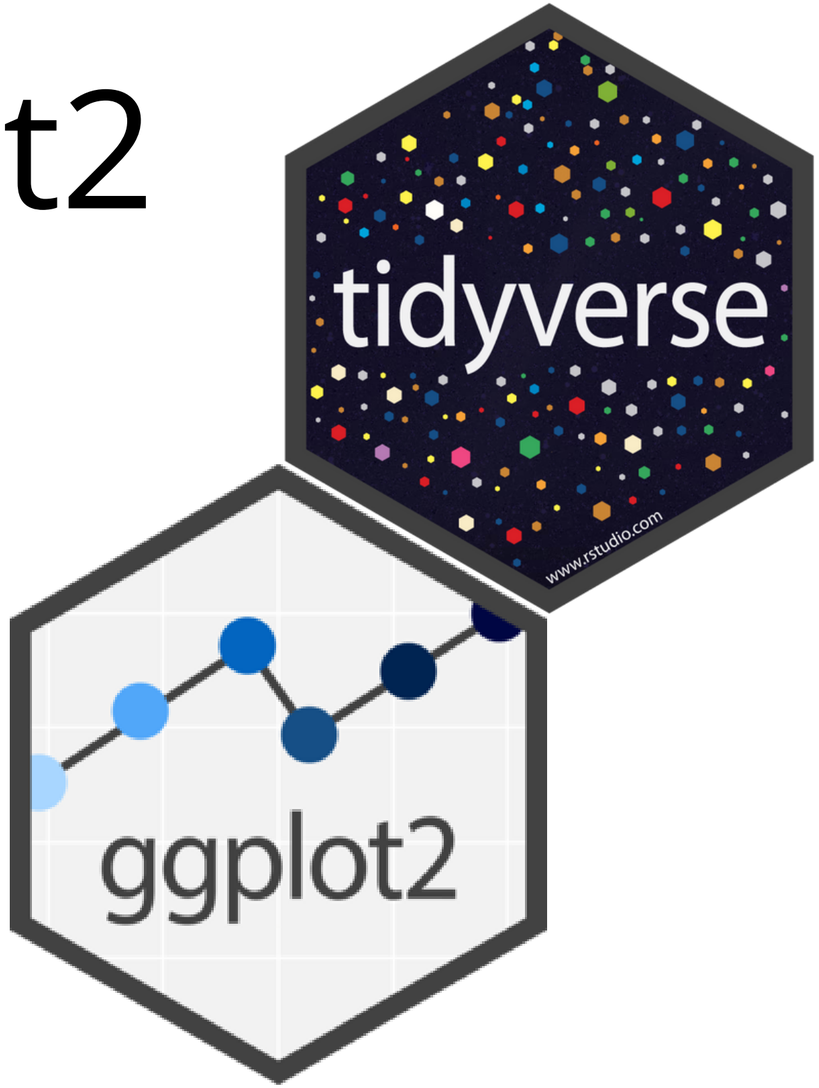
Gráficos em R: Introdução ao ggplot2

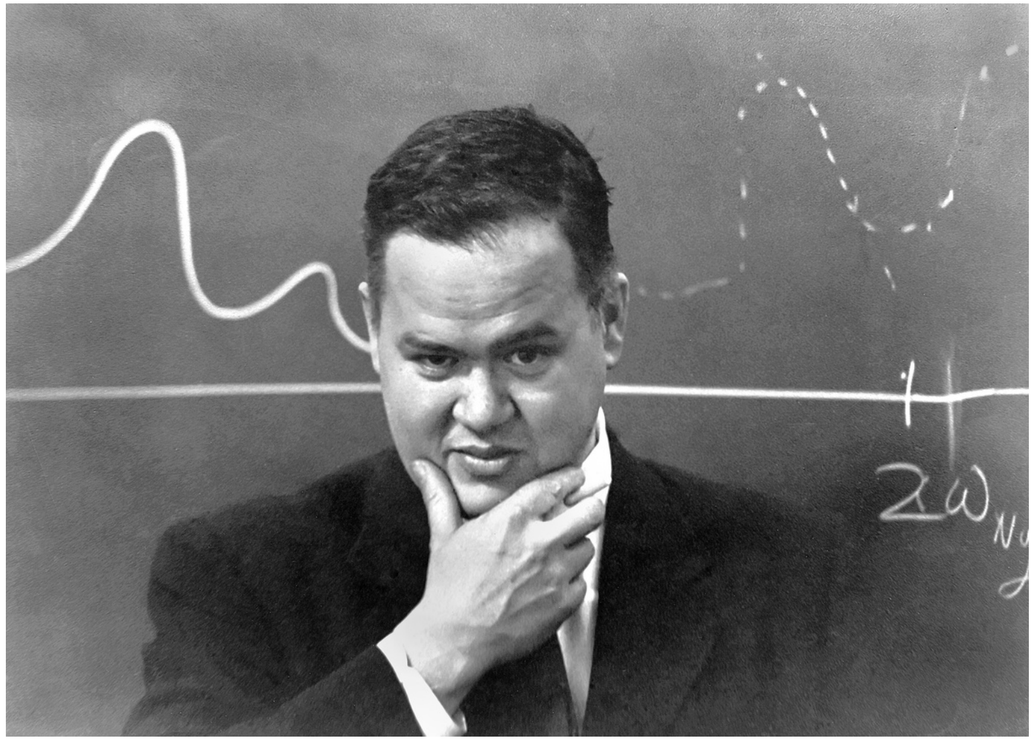


Gustavo Pesini

Gráficos

"O gráfico simples trouxe mais informações à mente do analista de dados do que qualquer outro dispositivo".

- John Tukey



O que é o ggplot2?

É um sistema para criação de gráficos “declarativamente”, baseado no livro “**The Grammar of Graphics**”. Você fornece os dados, diz ao ggplot2 como mapear variáveis para estética, quais primitivas gráficas usar e ele cuida dos detalhes.

https://ggplot2.tidyverse.org/

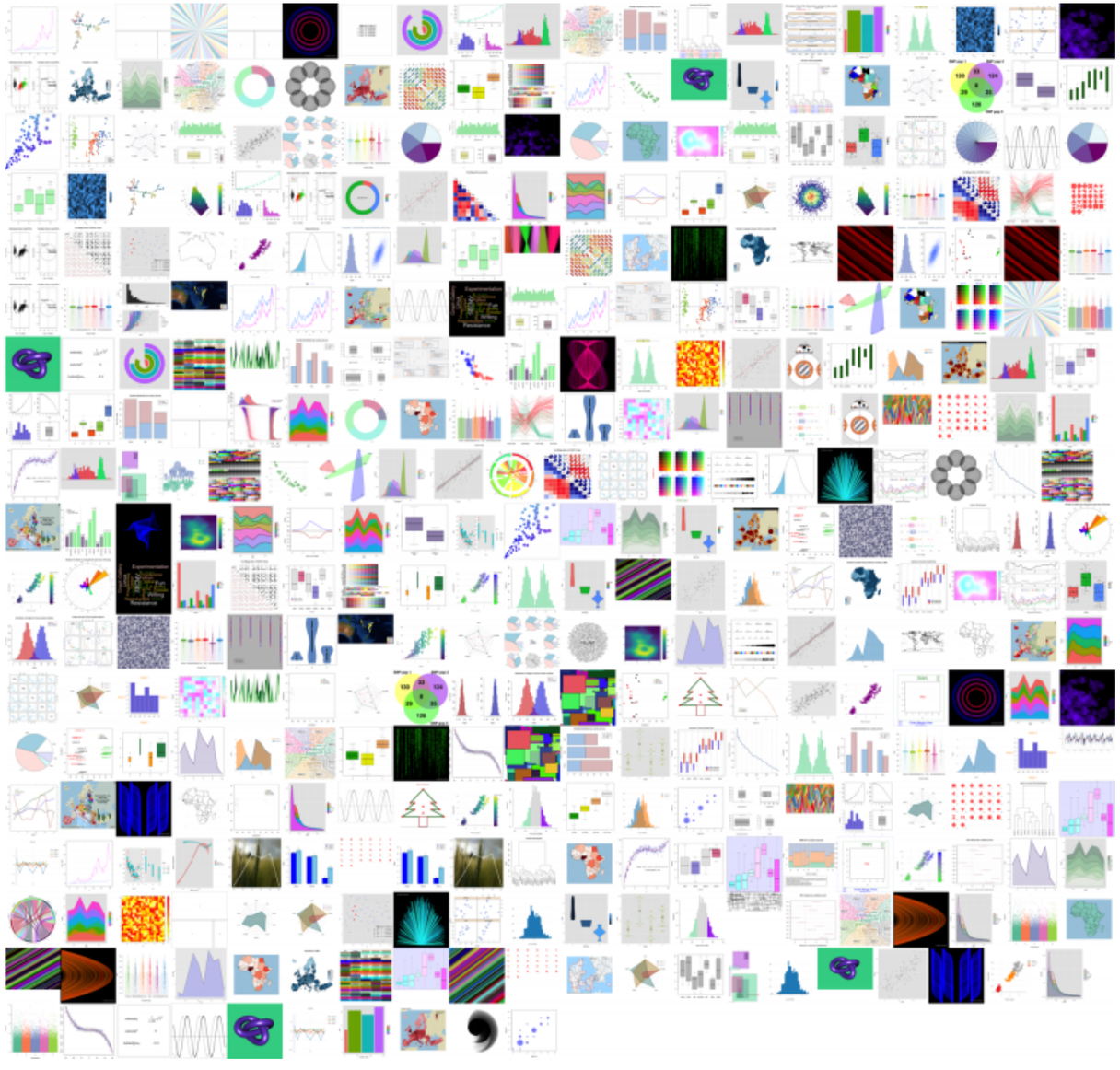
Por que o ggplot2?

Hadley Wickham

As habilidades transferíveis do ggplot2 não são peculiaridades de sintaxe de gráficos, mas um **método forte de pensar sobre visualização**, como uma forma de **mapeamento entre variáveis e as qualidades visuais de objetos geométricos** que você pode perceber.

https://twitter.com/hadleywickham

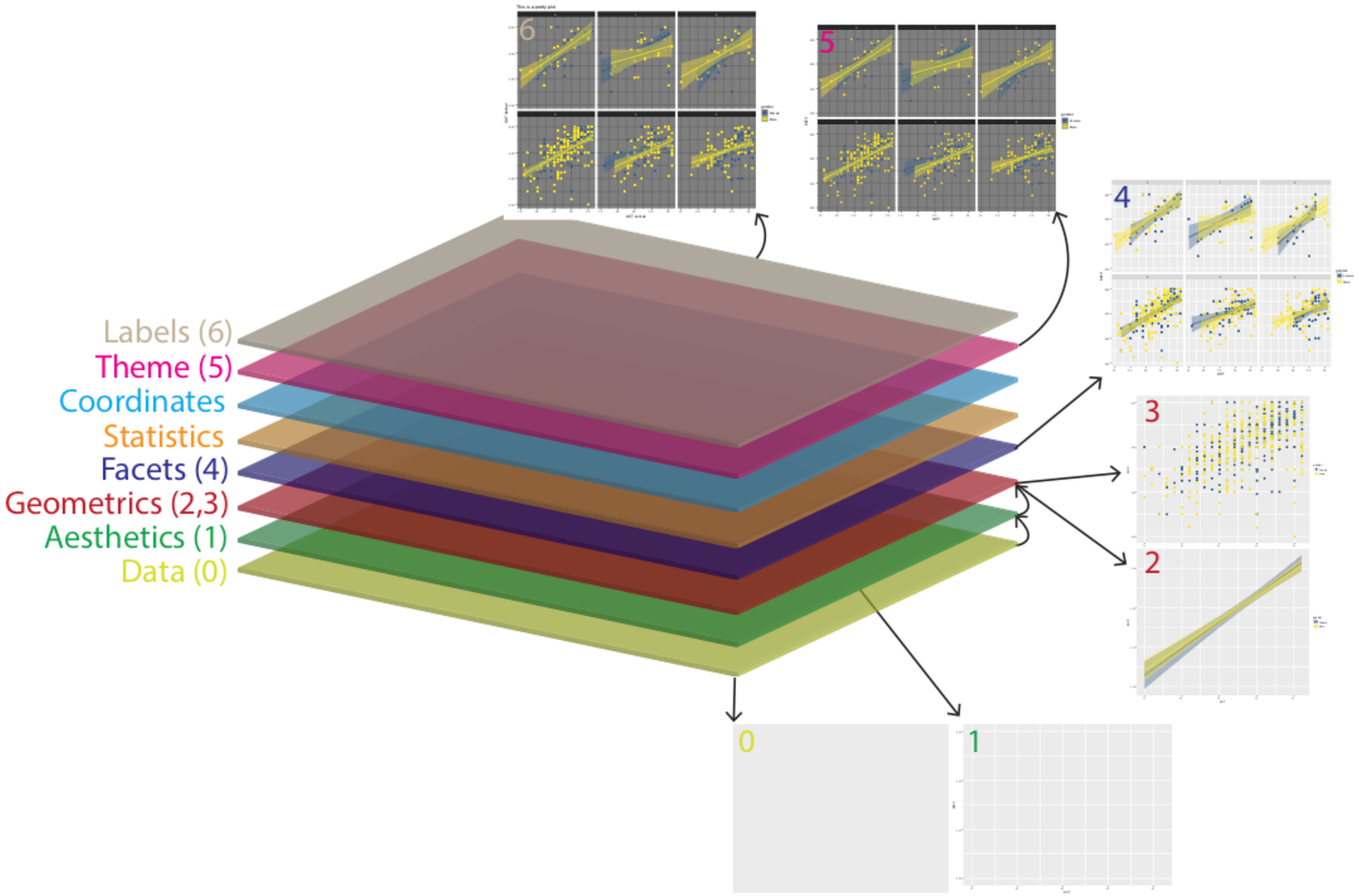
Que tipo de gráfico é possível fazer com o ggplot2?



Muitos...

https://r-graph-gallery.com/index.html

A gramática de gráficos



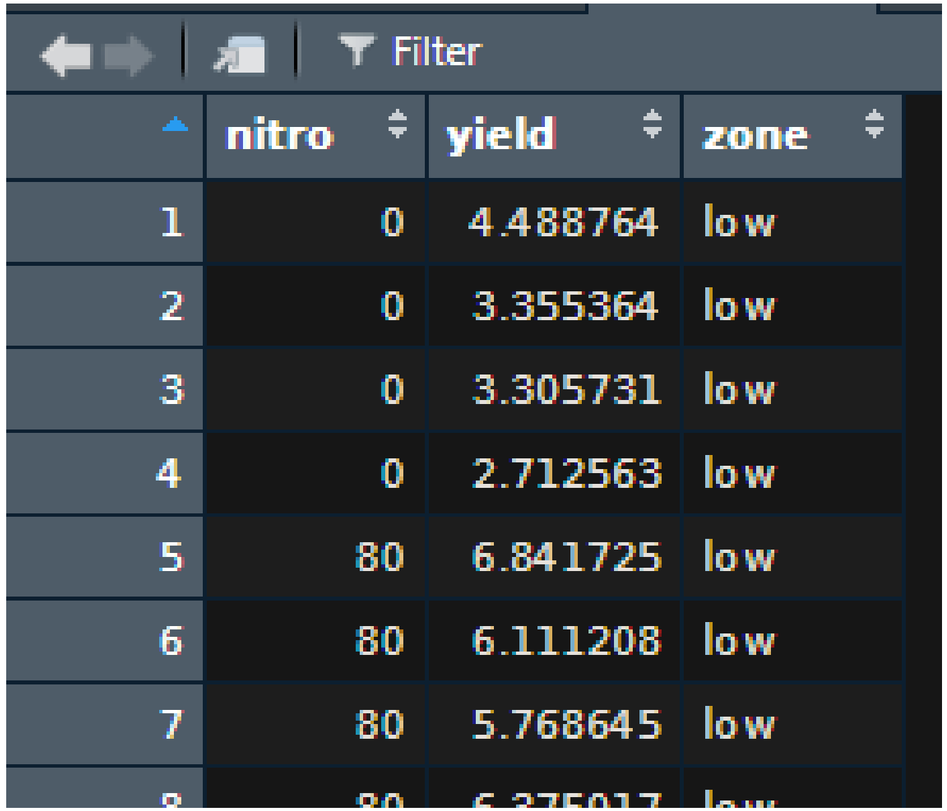
A gramática de gráficos em ggplot


```
ggplot(data = ...) +
  aes(x = ..., y = ...) +
  geom_function(stat = ...,  ) +
  coord_inate(...) +
  scale_function(...) +
  facet_function(...) +
  theme(...) +
  labs(...)
```

Pode-se descrever qualquer gráfico com a combinação desses 7 parâmetros

Iniciando... - carregamento de dados

```
# Pacote para os dados
library(agridat)

# Carregando os dados
data(bachmaier.nitrogen)

 # Trocando o nome do data frame
dados<-data.frame(bachmaier.nitrogen)

# Ver os dados
View(dados)
```



Filter

	nitro	yield	zone
1	0	4.488764	low
2	0	3.355364	low
3	0	3.305731	low
4	0	2.712563	low
5	80	6.841725	low
6	80	6.111208	low
7	80	5.768645	low
8	80	6.275017	low

Formato dos dados - importante!

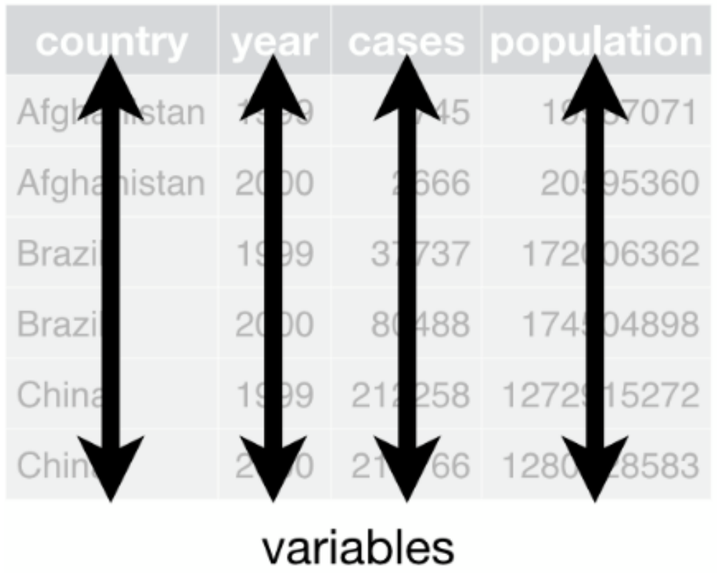
Os dados devem estar organizados no formato *tidy*

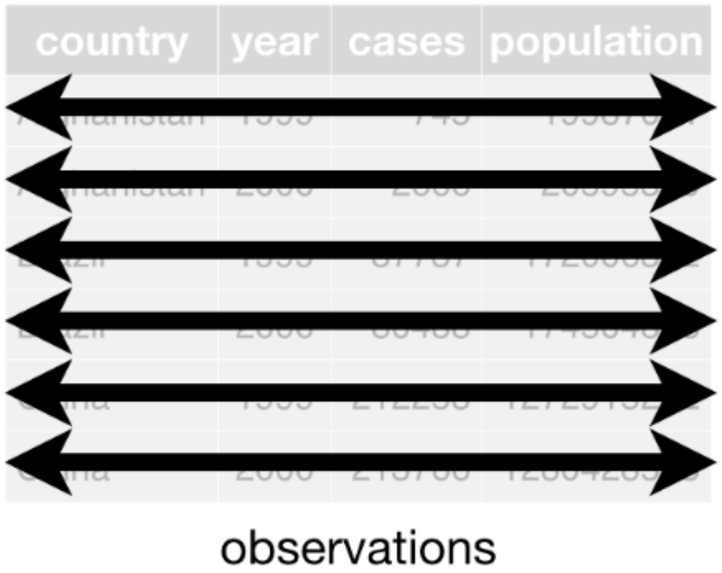
Isso Facilita o trabalho e o raciocínio com:

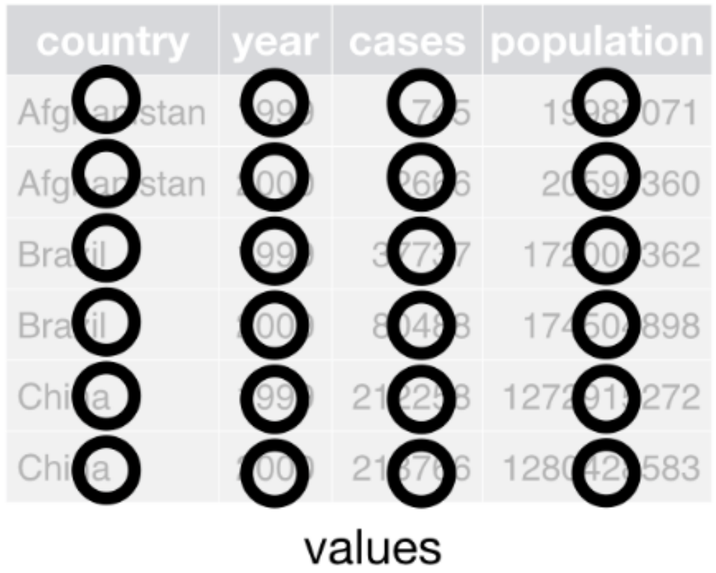
> Operações

> Manipulação

> Vizualização







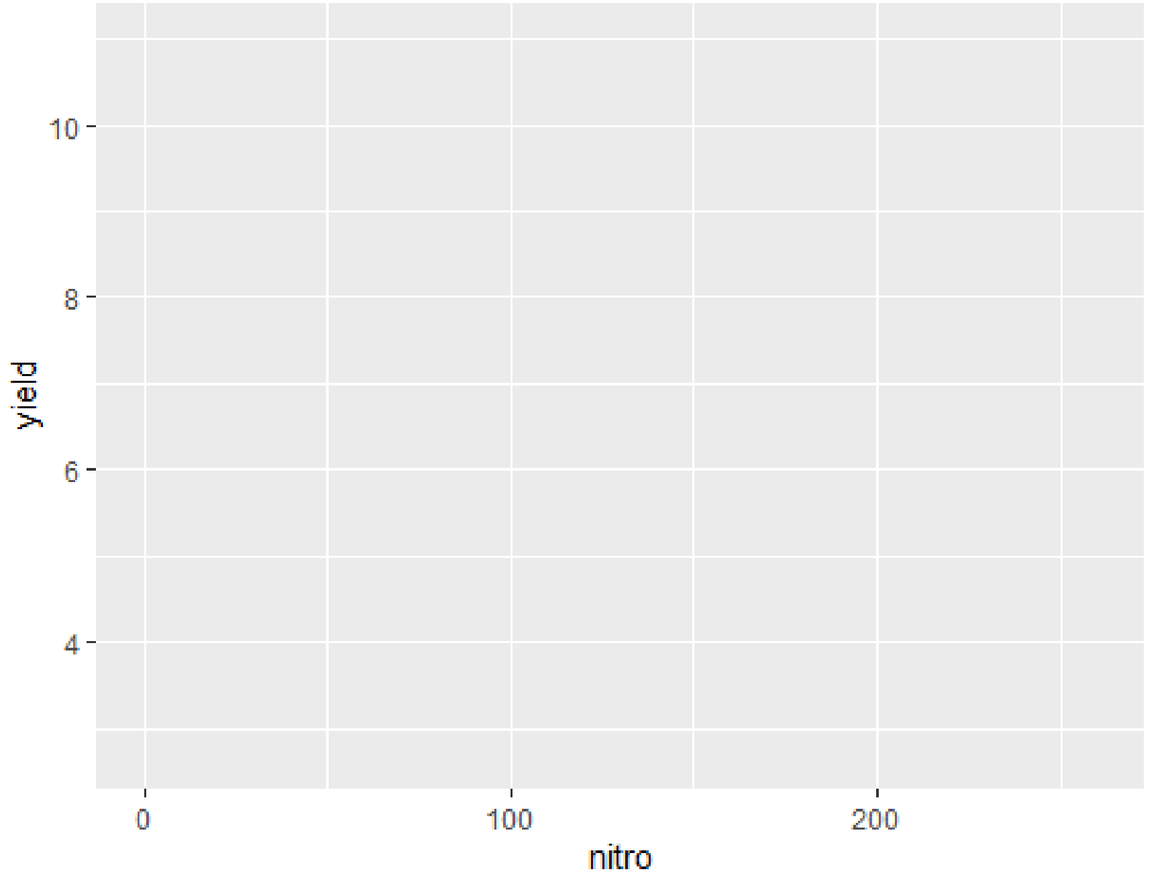
Criando as camadas...

```
install.packages("ggplot2")
library(ggplot2)

ggplot(data = dados)
```

```
ggplot(data = ...) +
  aes(x = ..., y = ...) +
  geom_function(stat = ...,  ) +
  coord_inate(...) +
  scale_function(...) +
  facet_function(...) +
  theme(...) +
  labs(...)
```

Criando as camadas...

```
install.packages("ggplot2")
library(ggplot2)

ggplot(data = dados,
mapping =  aes(x = nitro, y = yield))
```

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ggplot(data = ...) +
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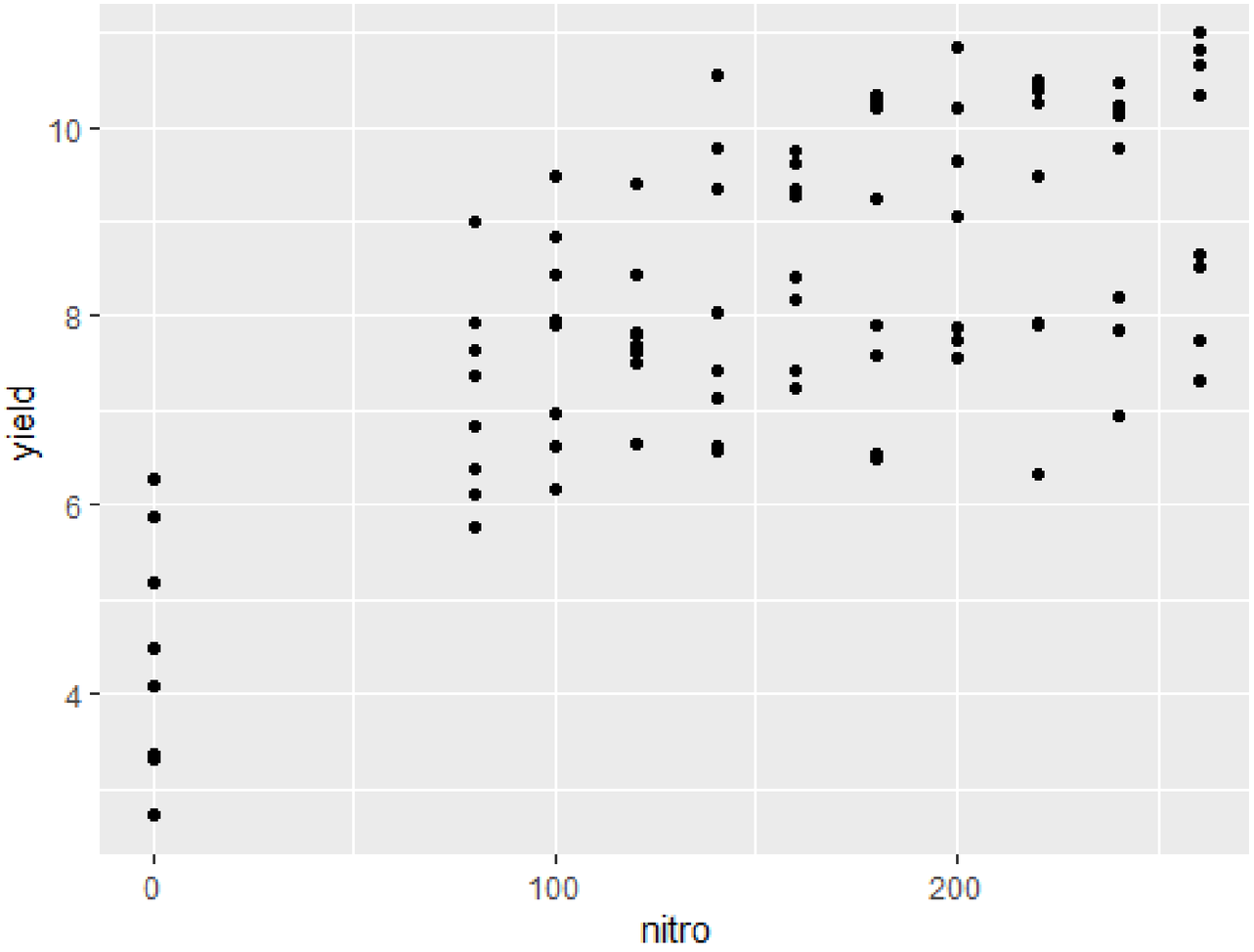
  coord_inate(...) +
  scale_function(...) +
  facet_function(...) +
  theme(...) +
  labs(...)
```

Criando as camadas...

```
install.packages("ggplot2")
library(ggplot2)

ggplot(data = dados,
mapping =  aes(x = nitro, y = yield))) +
geom_point(stat = "identity")
```

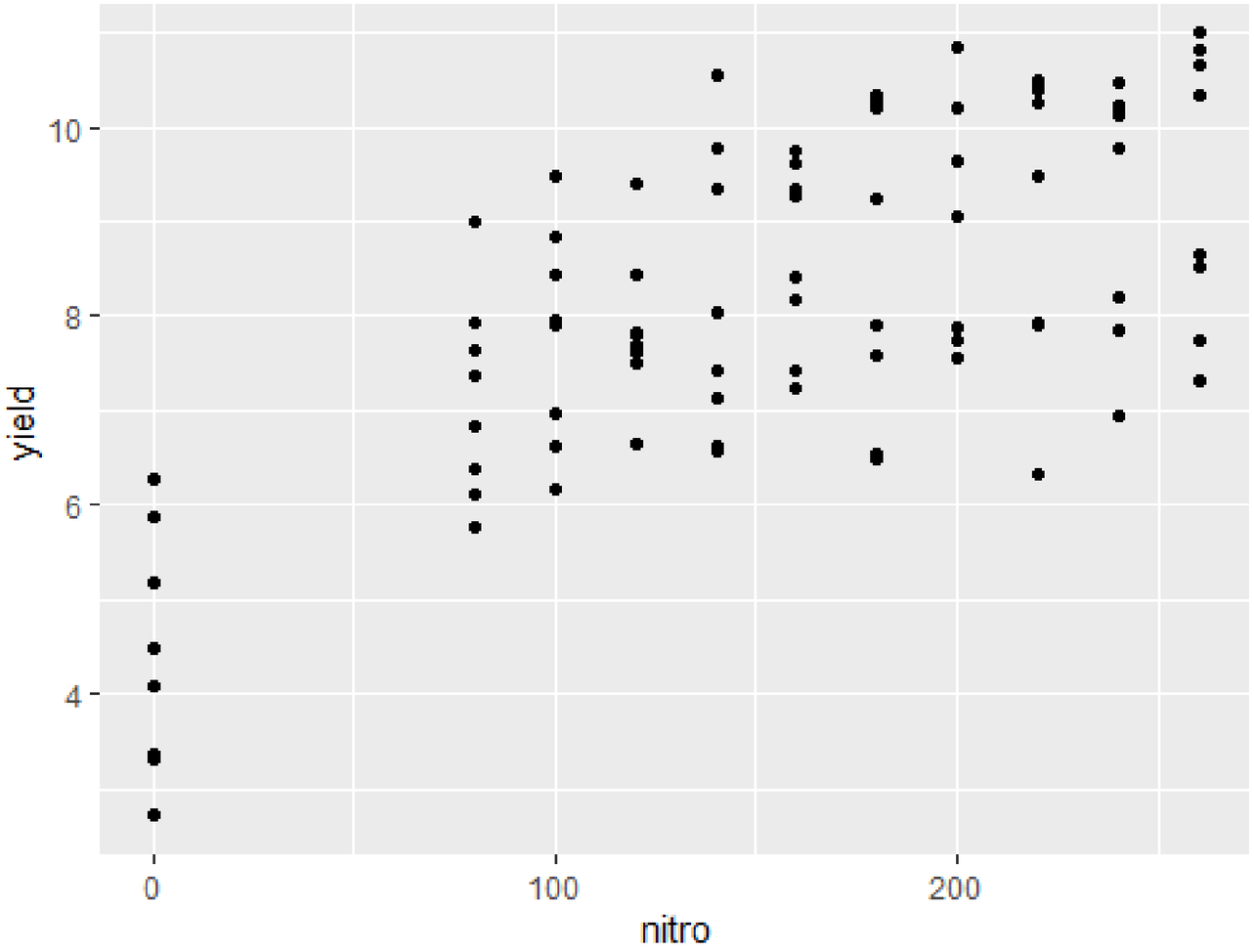


ggplot(data = ...) +
aes(x = ..., y = ...) +
geom_function(stat = ...,) +
coord_inate(...) +
scale_function(...) +
facet_function(...) +
theme(...) +
labs(...)

Criando as camadas...

```
install.packages("ggplot2")
library(ggplot2)

ggplot(data = dados,
mapping =  aes(x = nitro, y = yield))) +
geom_point(stat = "identity") +
coord_cartesian()
```



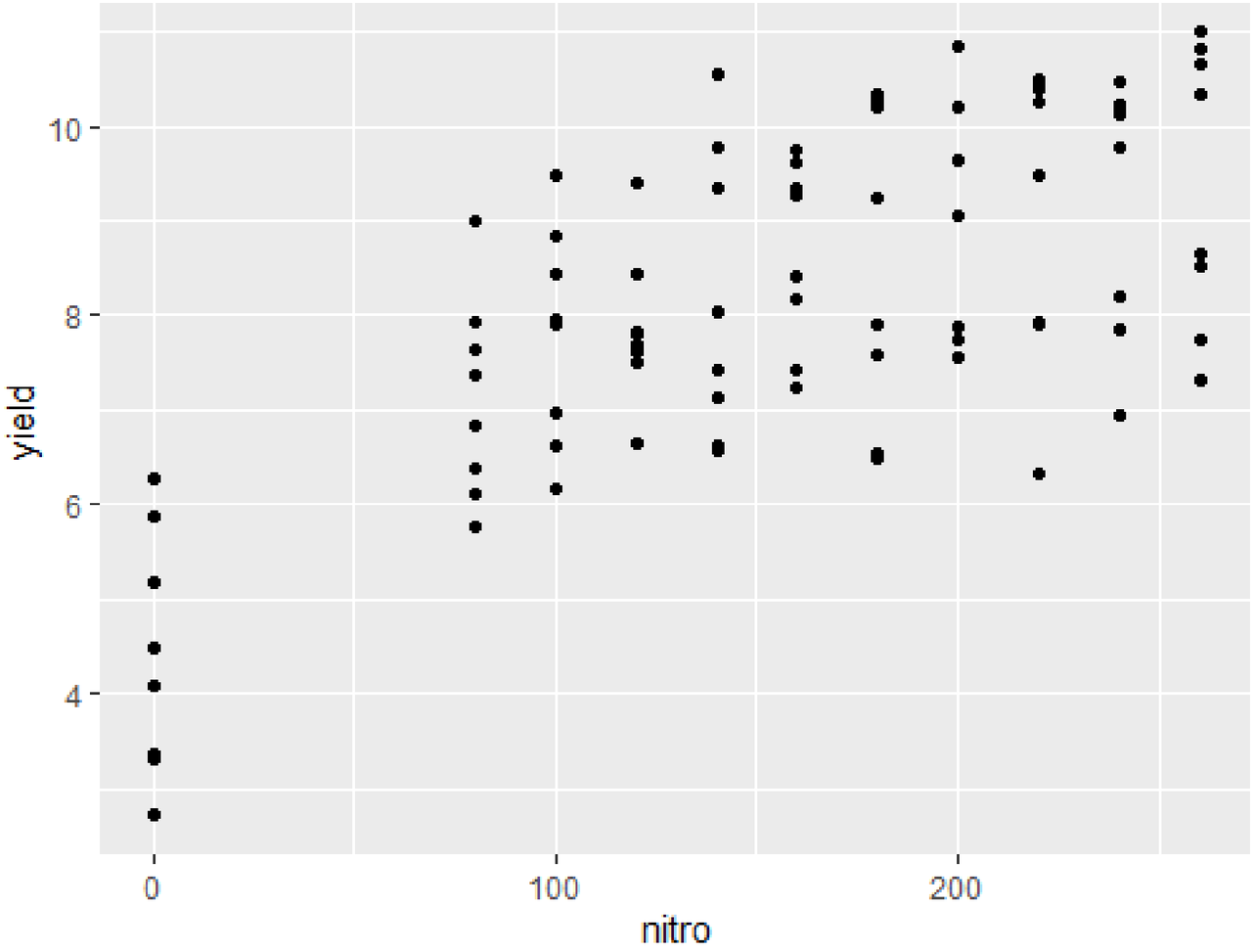
ggplot(data = ...) +
aes(x = ..., y = ...) +
geom_function(stat = ...,) +
coord_inate(...) +
scale_function(...) +
facet_function(...) +
theme(...) +
labs(...)

Criando as camadas...

Resumindo o script

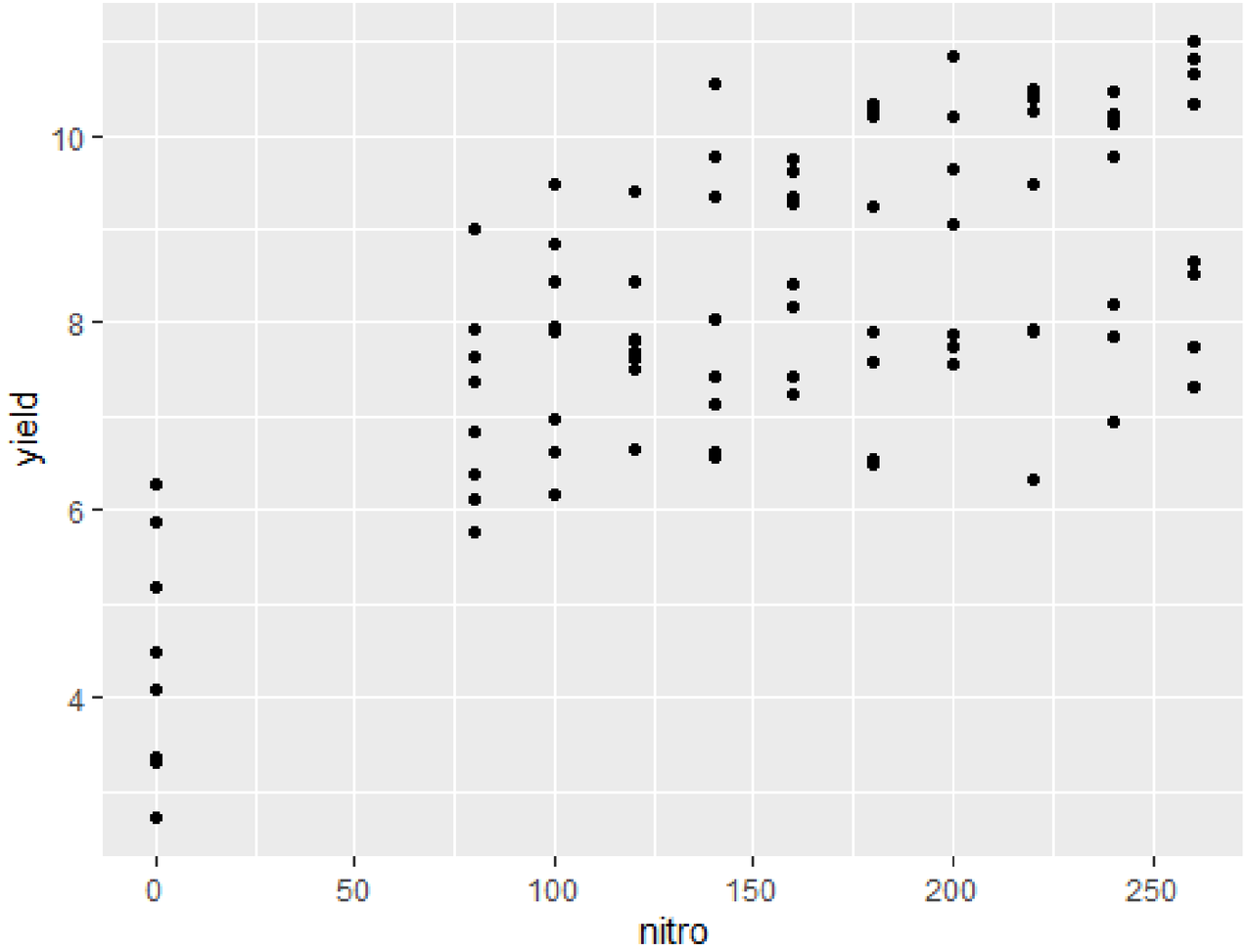
ggplot(dados, aes(nitro, yield)) +
geom_point()

ggplot(data = ...) +
aes(x = ..., y = ...) +
geom_function(stat = ...,) +
coord_inate(...) +
scale_function(...) +
facet_function(...) +
theme(...) +
labs(...)



Criando as camadas...

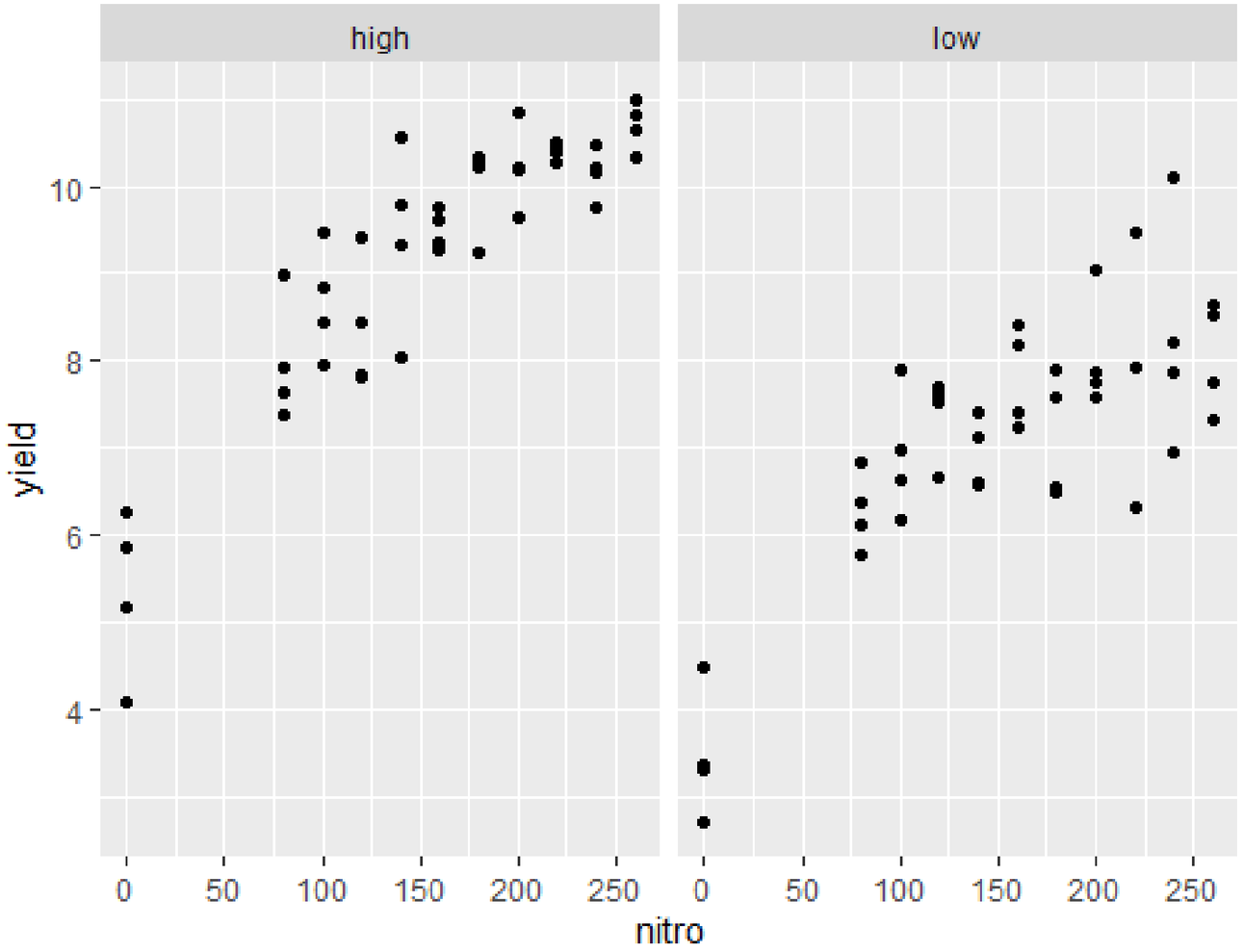
```
ggplot(dados, aes(nitro,  yield)) +
geom_point()+
scale_x_continuous(n.breaks = 6)
```




```
ggplot(data = ...) +
  aes(x = ..., y = ...) +
  geom_function(stat = ...,  ) +
  coord_inate(...) +
  scale_function(...) +
  facet_function(...) +
  theme(...) +
  labs(...)
```

Criando as camadas...

```
ggplot(dados, aes(nitro,  yield)) +
geom_point()+
scale_x_continuous(n.breaks = 6) +
facet_grid(~zone)
```

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ggplot(data = ...) +
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  geom_function(stat = ...,  ) +
  coord_inate(...) +
  scale_function(...) +
  facet_function(...) +
  theme(...) +
  labs(...)
```
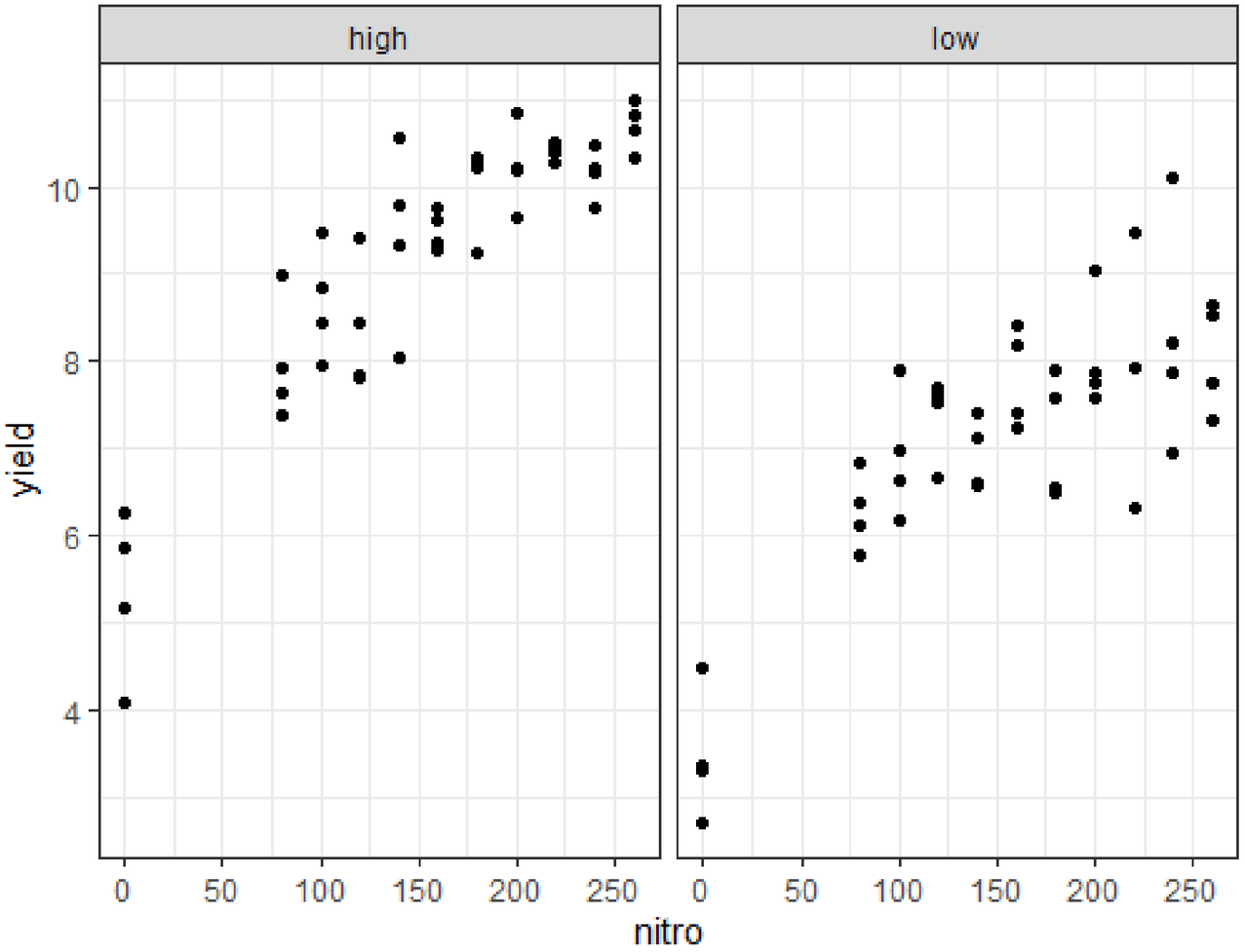

Criando as camadas...

```
ggplot(dados, aes(nitro,  yield)) +
geom_point()+
scale_x_continuous(n.breaks = 6) +
facet_grid(~zone) +
theme_bw()
```

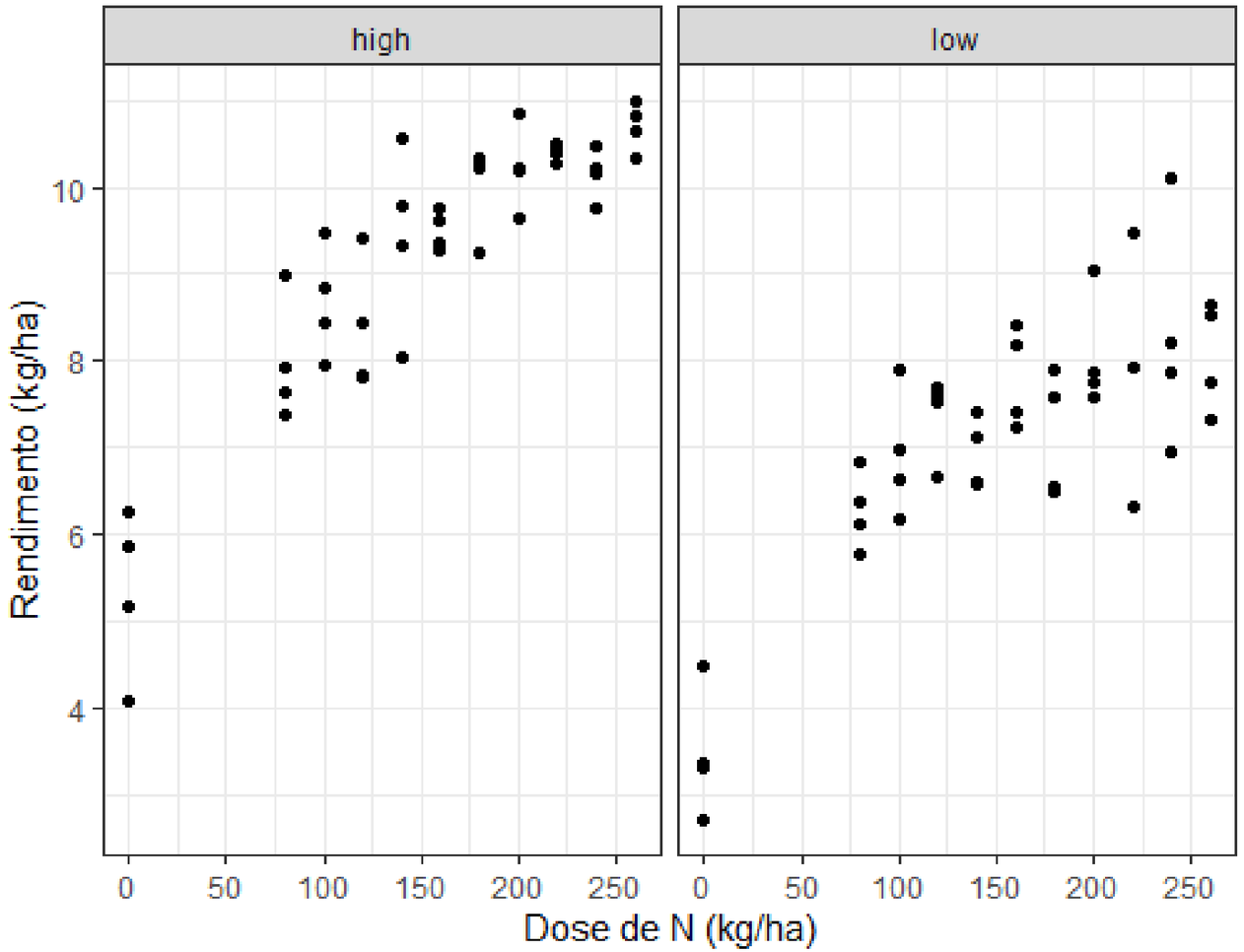


ggplot(data = ...) +
aes(x = ..., y = ...) +
geom_function(stat = ...,) +
coord_inate(...) +
scale_function(...) +
facet_function(...) +
theme(...) +
labs(...)

Criando as camadas...

```
ggplot(dados, aes(nitro,  yield)) +
geom_point()+
scale_x_continuous(n.breaks = 6) +
facet_grid(~zone) +
theme_bw() +
labs(x = "Dose de N (kg/ha)",
      y = "Rendimento (kg/ha)")
```

ggplot(data = ...) +
aes(x = ..., y = ...) +
geom_function(stat = ...,) +
coord_inate(...) +
scale_function(...) +
facet_function(...) +
theme(...) +
labs(...)



Alguns tipos de geom_*

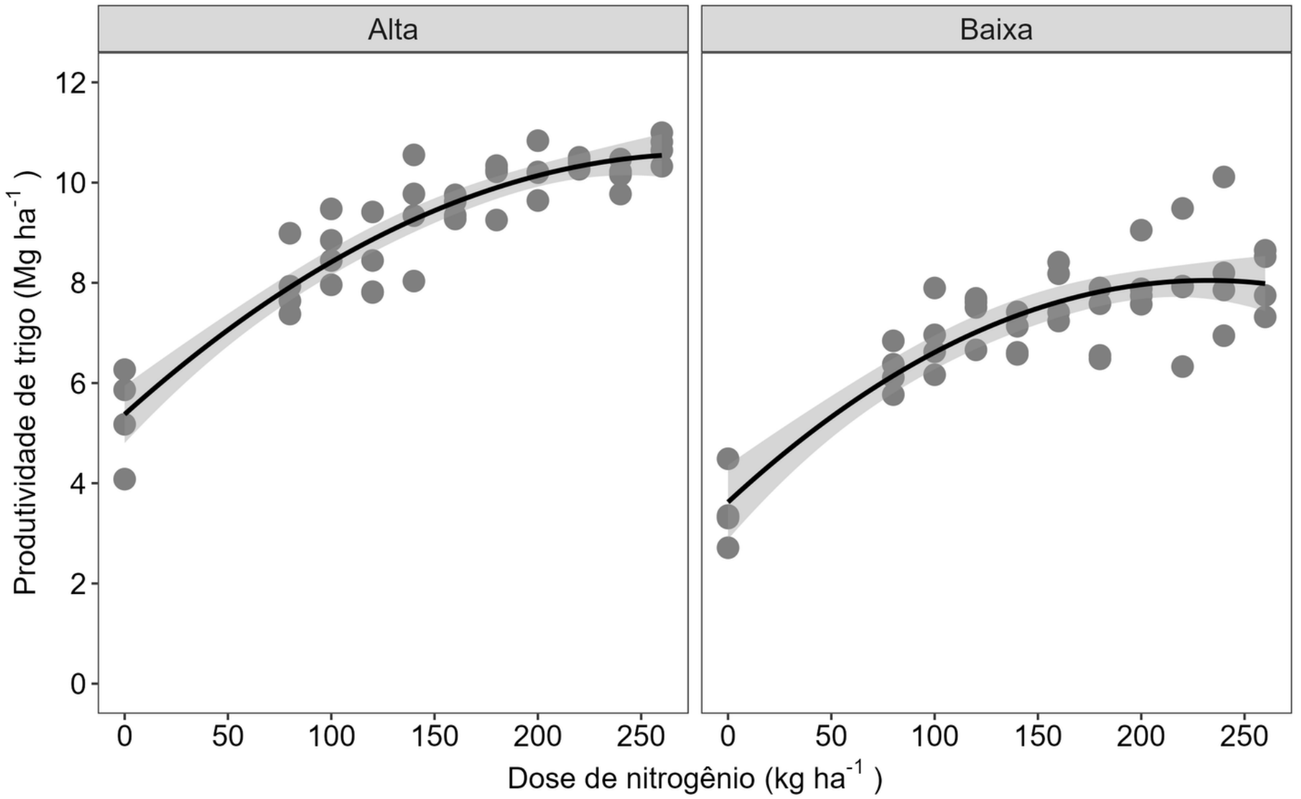
geom _bar	geom boxplot	geom_errorbar	geom_point	geom_sf_text
geom _bin2d	geom_area	geom_freqpoly	geom_pointrange	geom_smooth
geom _contour	geom_col	geom_hex	geom_polygon	geom_spoke
geom _errorbar	geom_count	geom_histogram	geom_qq_line	geom_step
geom _f_label	geom_crossbar	geom_hline	geom_raster	geom_text
geom _map	geom_curve	geom_jitter	geom_rect	geom_tile
geom _qq	geom_density	geom_label	geom_ribbon	geom_violin
geom _quantile	geom_density_2d	geom_line	geom_rug	geom_vline
geom abline	geom_density2d	geom_linerange	geom_segment	
geom blank	geom_dotplot	geom_path	geom_sf	

Alguns tipos scale_*

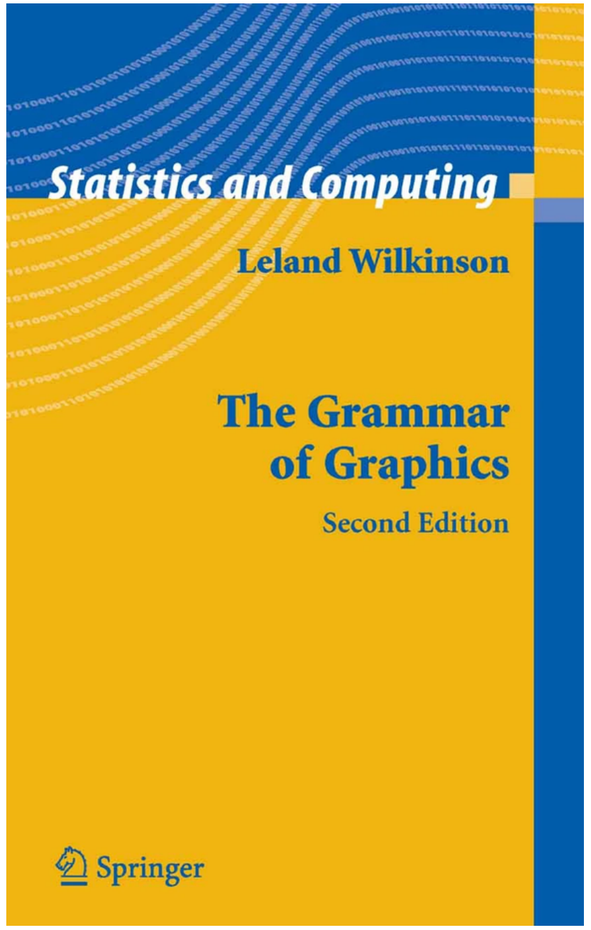
scale_alpha	scale_alpha_binned	scale_alpha_continuous	scale_alpha_discrete	scale_alpha_manual	scale_alpha_ordinal
scale_color_binned	scale_color_brewer	scale_color_continuous	scale_color_discrete	scale_color_distiller	scale_color_fermenter
scale_color_gradient	scale_color_gradient2	scale_color_gradientn	scale_color_grey	scale_color_hue	scale_color_manual
scale_color_steps	scale_color_steps2	scale_color_stepsn	scale_color_viridis_c	scale_color_viridis_d	scale_fill_brewer
scale_fill_continuous	scale_fill_discrete	scale_fill_distiller	scale_fill_fermenter	scale_fill_gradient	scale_fill_gradient2
scale_fill_gradientn	scale_fill_grey	scale_fill_hue	scale_fill_manual	scale_fill_steps	scale_fill_steps2
scale_fill_stepsn	scale_fill_viridis_b	scale_fill_viridis_c	scale_fill_viridis_d	scale_linetype	scale_linetype_discrete
scale_linetype_manual	scale_radius	scale_shape	scale_shape_binned	scale_shape_discrete	scale_shape_manual
scale_size	scale_size_area	scale_size_binned	scale_size_binned_area	scale_size_continuous	scale_size_manual
scale_x_binned	scale_x_continuous	scale_x_date	scale_x_datetime	scale_x_discrete	scale_x_log10
scale_x_reverse	scale_x_sqrt	scale_x_time	scale_y_binned	scale_y_continuous	scale_y_date
scale_y_datetime	scale_y_discrete	scale_y_log10	scale_y_reverse	scale_y_sqrt	scale_y_time

Adicionando outras camadas/comandos no gráfico

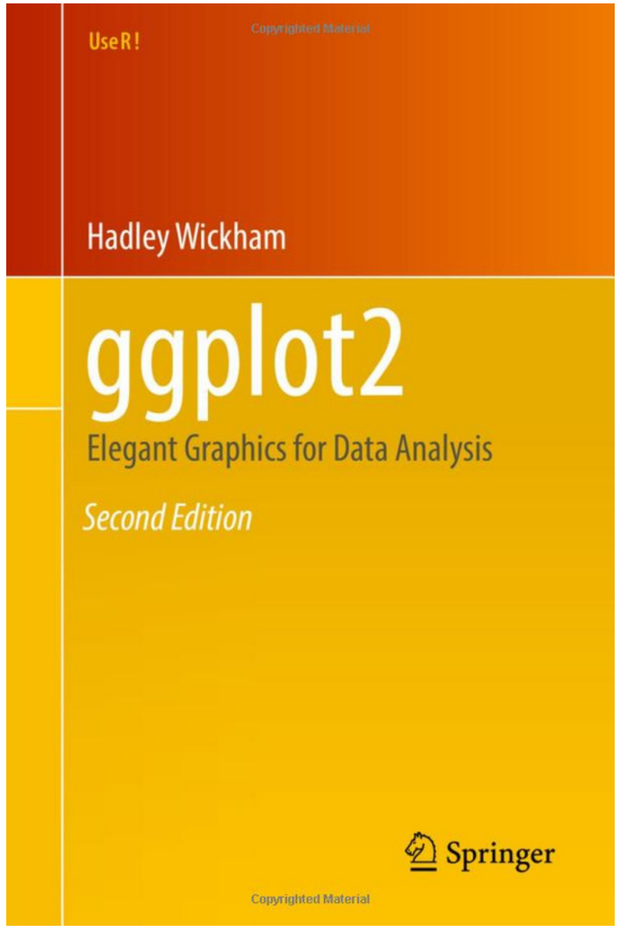
```
ggplot(dados, aes(nitro, yield, color = zone_pt))+
  geom_point(size = 4)+
  geom_smooth(method = 'lm', formula = y~poly(x,2),
        color = 'black', se = T)+
  facet_grid(~ zone_pt)+
  theme_bw()+
  theme(axis.text = element_text(size=13,  color = "black"),
        axis.title = element_text(size=13,  color = "black"),
        strip.text = element_text(size = 13),
        legend.position = "none",
        panel.grid = element_blank())+
  scale_color_manual(values = c("high" = 'darkgray', "low" =
'darkgray'))+
  xlab(expression("Dose de nitrogênio (kg ha"^"-1"~")"))+
  ylab(expression("Produtividade de trigo (Mg ha"^"-1"~")"))+
  scale_x_continuous(n.breaks = 6)+
  scale_y_continuous(limits = c(0, 12), breaks = seq(0, 12, by = 2))
```



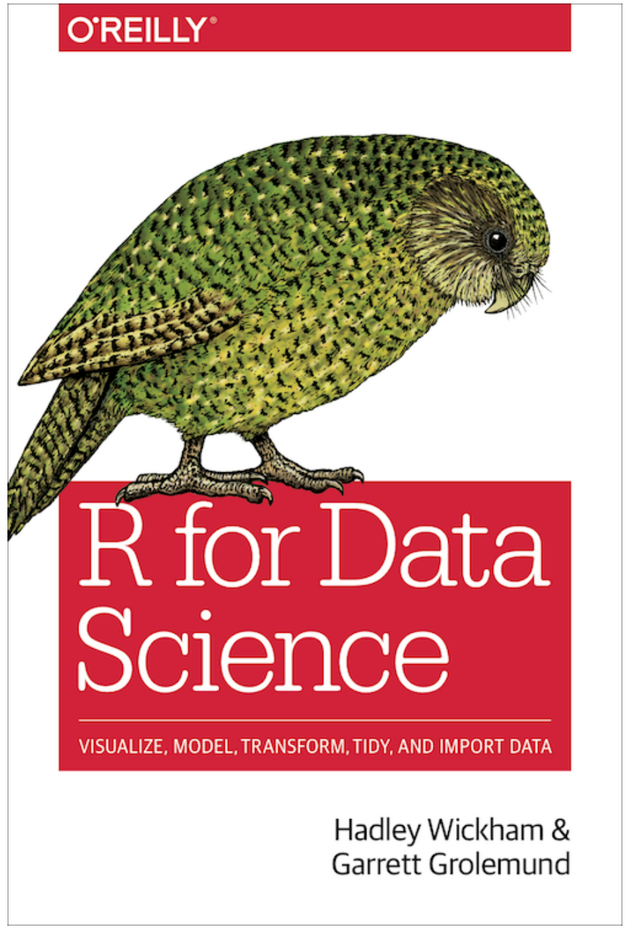
Materiais de apoio



https://ggplot2-book.org/

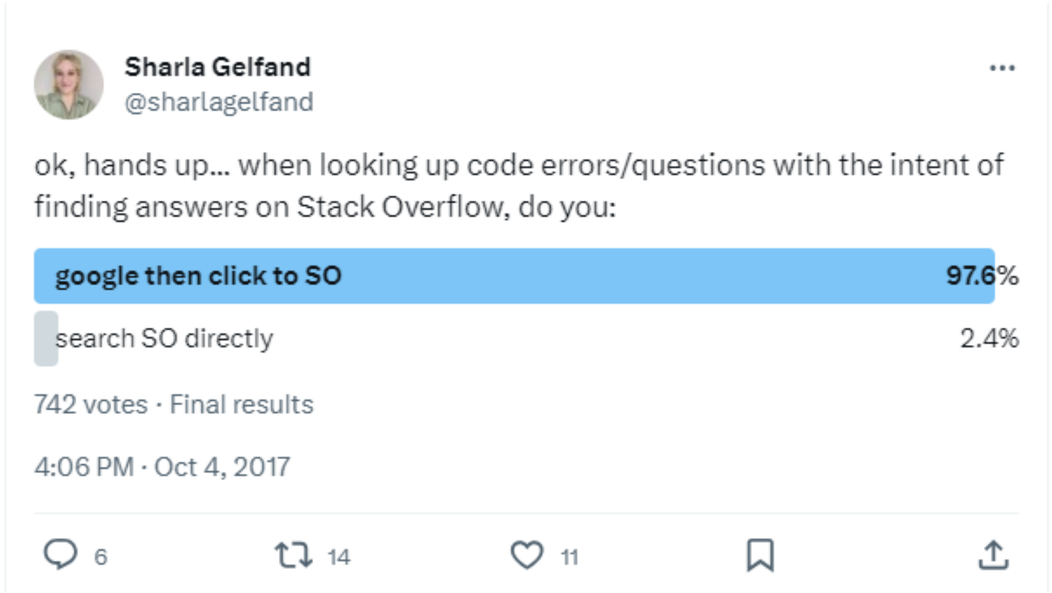


https://link.springer.com/book/10.1007/0-387-28695-0



https://r4ds.had.co.nz/index.html

Materiais de apoio



stackoverflow

Google

ChatGPT

Prática