Modeling in R and Tidying Results

linear models and broom

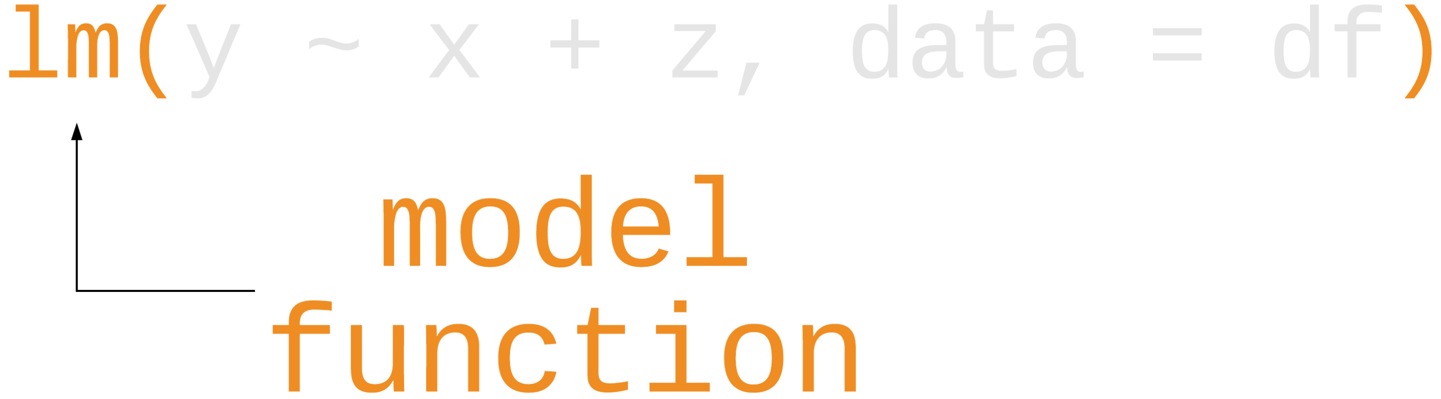
2021-03-04

⚠️ This is not a course in a regression

Modeling in R

```
lm(y ~ x + z, data = df)
```

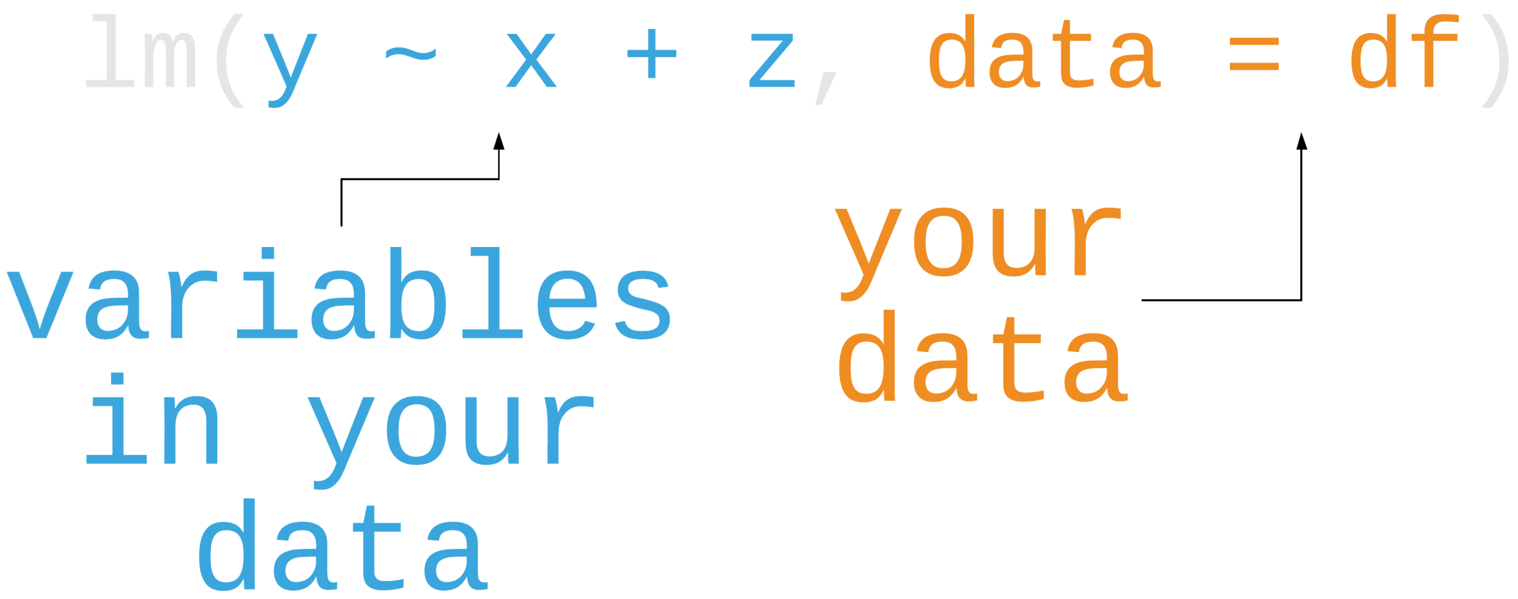
Modeling in R



```
lm(y ~ x + z, data = df)
```

model function

Modeling in R

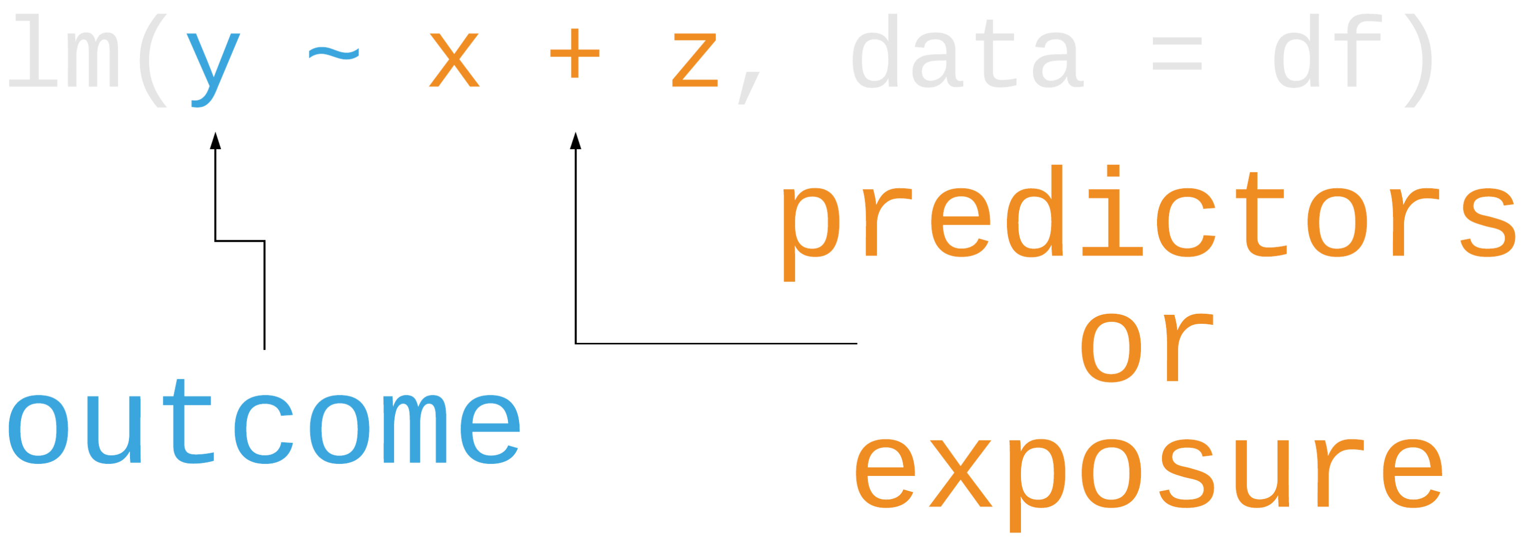


```
lm(y ~ x + z, data = df)
```

variables in your data

your data

Modeling in R



```
lm(y ~ x + z, data = df)
```

outcome

predictors
or
exposure

Modeling in R

lm() = Linear Regression (OLS)

Modeling in R

lm() = **Linear Regression (OLS)**

glm() = **Generalized Linear Model (default family = Gaussian)**

Modeling in R

```
lm(price ~ carat, data = diamonds)
```

Modeling in R

```
lm(price ~ carat, data = diamonds)
```

```
## 
## Call:
## lm(formula = price ~ carat, data = diamonds)
## 
## Coefficients:
## (Intercept)        carat
##       -2256         7756
```

Modeling in R

```
lm(price ~ carat, data = diamonds) %>%
  summary()
```

Modeling in R

```
##
## Call:
## lm(formula = price ~ carat, data = diamonds)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -18585.3   -804.8    -18.9    537.4  12731.7
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept) -2256.36      13.06  -172.8   <2e-16 ***
## carat        7756.43      14.07   551.4   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1549 on 53938 degrees of freedom
## Multiple R-squared:  0.8493,    Adjusted R-squared:  0.8493
## F-statistic: 3.041e+05 on 1 and 53938 DF,  p-value: < 2.2e-16
```

Modeling in R

```
## 
## Call:
## lm(formula = price ~ carat, data = diamonds)
## 
## Residuals:
##      Min       1Q   Median       3Q      Max 
## -18585.3   -804.8    -18.9    537.4  12731.7 
## 
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)    
## (Intercept) -2256.36      13.06  -172.8   <2e-16 ***
## carat        7756.43      14.07   551.4   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## 
## Residual standard error: 1549 on 53938 degrees of freedom
## Multiple R-squared:  0.8493,    Adjusted R-squared:  0.8493 
## F-statistic: 3.041e+05 on 1 and 53938 DF,  p-value: < 2.2e-16
```

broom: **tidy models**

tidy()

glance()

augment()

broom: **tidy models**

tidy() = **model coefficients**

glance()

augment()

broom: **tidy models**

tidy()

glance() = **model fit**

augment()

broom: **tidy models**

tidy()

glance()

augment() = **model predictions**

broom: **tidy models**

tidy()

glance()

augment()

NOT a core member of the tidyverse. Need to load with library(broom)

Modeling in R

```r
library(broom)
lm(price ~ carat, data = diamonds) %>%
  tidy()
```

Modeling in R

```r
library(broom)
lm(price ~ carat, data = diamonds) %>%
  tidy()
```

```
## # A tibble: 2 x 5
##   term        estimate std.error statistic p.value
##   <chr>          <dbl>     <dbl>     <dbl>   <dbl>
## 1 (Intercept)   -2256.      13.1     -173.       0
## 2 carat          7756.      14.1      551.       0
```

Modeling in R

```r
lm(price ~ carat, data = diamonds) %>%
  glance()
```

Modeling in R

```
lm(price ~ carat, data = diamonds) %>%
  glance()
```

```
## # A tibble: 1 x 12
##   r.squared adj.r.squared sigma statistic p.value    df
##       <dbl>         <dbl> <dbl>     <dbl>   <dbl> <dbl>
## 1     0.849         0.849 1549.   304051.       0     1
## # … with 6 more variables: logLik <dbl>, AIC <dbl>,
## #   BIC <dbl>, deviance <dbl>, df.residual <int>,
## #   nobs <int>
```

Modeling in R

```r
lm(price ~ carat, data = diamonds) %>%
  augment()
```

Modeling in R

```
lm(price ~ carat, data = diamonds) %>%
  augment()
```

```
## # A tibble: 53,940 x 8
##     price carat .fitted .resid      .hat .sigma     .cooksd
##     <int> <dbl>   <dbl>  <dbl>     <dbl>  <dbl>       <dbl>
##   1   326 0.23  -472.     798. 0.0000452  1549. 0.00000600
##   2   326 0.21  -628.     954. 0.0000471  1549. 0.00000892
##   3   327 0.23  -472.     799. 0.0000452  1549. 0.00000602
##   4   334 0.290   -7.00   341. 0.0000398  1549. 0.000000966
##   5   335 0.31   148.     187. 0.0000382  1549. 0.000000278
##   6   336 0.24  -395.     731. 0.0000442  1549. 0.00000493
##   7   336 0.24  -395.     731. 0.0000442  1549. 0.00000493
##   8   337 0.26  -240.     577. 0.0000424  1549. 0.00000294
##   9   337 0.22  -550.     887. 0.0000461  1549. 0.00000756
##  10   338 0.23  -472.     810. 0.0000452  1549. 0.00000618
## # … with 53,930 more rows, and 1 more variable:
## #   .std.resid <dbl>
```

Try it yourself

Work your way through the exercises. If anything in particular is giving you trouble, we'll work through it together.

Resources

R for Data Science: A comprehensive but friendly introduction to the tidyverse. Free online.

UCLA IDRE: Useful resources on modeling in R and other languages