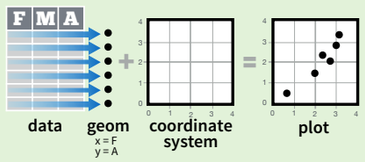
Visualización de Datos
usando ggplot2
Guía Rápida

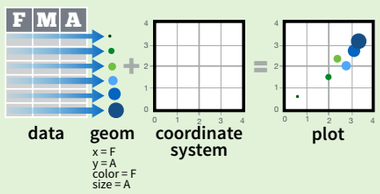
RStudio®

Conceptos Básicos

ggplot2 se basa en la idea que cualquier gráfica se puede construir usando estos tres componentes: **datos**, **coordenadas** y **objetos geométricos (geoms).** Este concepto se llama: **gramática de las gráficas.**



Para visualizar resultados, asigne variables a las propiedades visuales, o **estéticas**, como **tamaño**, **color** y **posición x** o **y**.



Para construir una grática complete este patrón

```
ggplot(data = <DATOS>) +
  <FUNCION_GEOM> (
    mapping =aes( <ESTETICAS> ),
    stat = <STAT> ,
    position = <POSICION>
  ) +
  <FUNCION_COORDINADAS> +
  <FUNCION_FACETA> +
  <FUNCION_ESCALA> +
  <FUNCION_TEMA>
```

Requerido

No Requerido, se proveen valores iniciales

ggplot(data = mpg, **aes(**x = cty, y = hwy**))**

Este comando comienza una gráfica, complétela mediante agregando capas, un **geom** por capa.

estéticas · datos · geom

qplot(x = cty, y = hwy, data = mpg, geom = "point"**)**

Este comando es una gráfica completa, tiene datos, las estéticas están asignadas y por lo menos un geom.

last_plot()

Devuelve la última gráfica

ggsave("plot.png", width = 5, height = 5)

La última gráfica es grabada como una imagen de 5 por 5 pulgs., usa el mismo tipo de archivo que la extensión

Geoms - Funciones geom se utilizan para visualizar resultados. Asigne variables a las propiedades estéticas del geom. Cada geom forma una capa.

Geométricas Elementales

a <- ggplot(economics, aes(date, unemploy))
b <- ggplot(seals, aes(x = long, y = lat))

a + geom_blank()
(Bueno para expandir límites)

b + geom_curve(aes(yend = lat + 1, xend=long+1,curvature=z)**)** - x, xend, y, yend, alpha, angle, color, curvature, linetype, size

a + geom_path(lineend="butt", linejoin="round', linemitre=1**)**
x, y, alpha, color, group, linetype, size

a + geom_polygon(aes(group = group)**)**
x, y, alpha, color, fill, group, linetype, size

b + geom_rect(aes(xmin = long, ymin=lat, xmax= long + 1, ymax = lat + 1)**)** - xmax, xmin, ymax, ymin, alpha, color, fill, linetype, size

a + geom_ribbon(aes(ymin=unemploy - 900, ymax=unemploy + 900)**)** - x, ymax, ymin alpha, color, fill, group, linetype, size

Segmentos Lineares

propiedades básicas: x, y, alpha, color, linetype, size

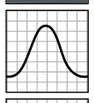
b + geom_abline(aes(intercept=0, slope=1)**)**
b + geom_hline(aes(yintercept = lat)**)**
b + geom_vline(aes(xintercept = long)**)**
b + geom_segment(aes(yend=lat+1, xend=long+1)**)**
b + geom_spoke(aes(angle = 1:1155, radius = 1)**)**

Una Variable

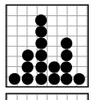
Continua

c <- ggplot(mpg, aes(hwy)); c2 <- ggplot(mpg)

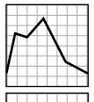
c + geom_area(stat = "bin")
x, y, alpha, color, fill, linetype, size



c + geom_density(kernel = "gaussian"**)**
x, y, alpha, color, fill, group, linetype, size, weight

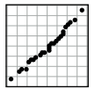


c + geom_dotplot()
x, y, alpha, color, fill



c + geom_freqpoly()
x, y, alpha, color, group, linetype, size

c + geom_histogram(binwidth = 5**)**
x, y, alpha, color, fill, linetype, size, weight



c2 + geom_qq(aes(sample = hwy)**)**
x, y, alpha, color, fill, linetype, size, weight

Discreta

d <- ggplot(mpg, aes(fl))

d + geom_bar()
x, alpha, color, fill, linetype, size, weight

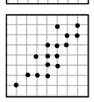
Dos Variables

X Continua, Y Continua

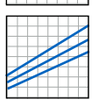
e <- ggplot(mpg, aes(cty, hwy))

e + geom_label(aes(label = cty), nudge_x = 1, nudge_y = 1, check_overlap = TRUE**)**
x, y, label, alpha, angle, color, family, fontface, hjust, lineheight, size, vjust

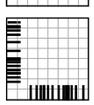
e + geom_jitter(height = 2, width = 2**)**
x, y, alpha, color, fill, shape, size



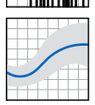
e + geom_point()
x, y, alpha, color, fill, shape, size, stroke



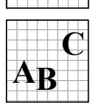
e + geom_quantile()
x, y, alpha, color, group, linetype, size, weight



e + geom_rug(sides = "bl"**)**
x, y, alpha, color, linetype, size



e + geom_smooth(method = lm**)**
x, y, alpha, color, fill, group, linetype, size, weight

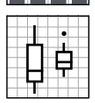


e + geom_text(aes(label = cty), nudge_x = 1, nudge_y = 1, check_overlap = TRUE**)**
x, y, label, alpha, angle, color, family, fontface, hjust, lineheight, size, vjust

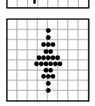
X Discreta, Y Continua

f <- ggplot(mpg, aes(class, hwy))

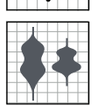
f + geom_col()
x, y, alpha, color, fill, group, linetype, size



f + geom_boxplot()
x, y, lower, middle, upper, ymax, ymin, alpha, color, fill, group, linetype, shape, size, weight



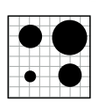
f + geom_dotplot(binaxis = "y", stackdir = "center"**)**
x, y, alpha, color, fill, group



f + geom_violin(scale = "area"**)**
x, y, alpha, color, fill, group, linetype, size, weight

X Discreta, Y Discreta

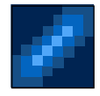
g <- ggplot(diamonds, aes(cut, color))



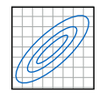
g + geom_count()
x, y, alpha, color, fill, shape, size, stroke

Distribución Bivariada Continua

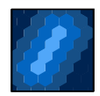
h <- ggplot(diamonds, aes(carat, price))



h + geom_bin2d(binwidth = c(0.25, 500)**)**
x, y, alpha, color, fill, linetype, size, weight



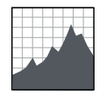
h + geom_density2d()
x, y, alpha, colour, group, linetype, size



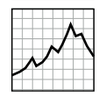
h + geom_hex()
x, y, alpha, colour, fill, size

Función Continua

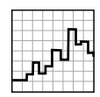
i <- ggplot(economics, aes(date, unemploy))



i + geom_area()
x, y, alpha, color, fill, linetype, size



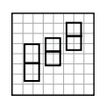
i + geom_line()
x, y, alpha, color, group, linetype, size



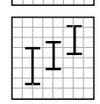
i + geom_step(direction = "hv"**)**
x, y, alpha, color, group, linetype, size

Visualizando el Error

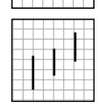
df <- data.frame(grp = c("A", "B"), fit = 4:5, se = 1:2)
j <- ggplot(df, aes(grp, fit, ymin = fit-se, ymax = fit+se))



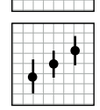
j + geom_crossbar(fatten = 2**)**
x, y, ymax, ymin, alpha, color, fill, group, linetype, size



j + geom_errorbar()
x, ymax, ymin, alpha, color, group, linetype, size, width (also **geom_errorbarh()**)



j + geom_linerange()
x, ymin, ymax, alpha, color, group, linetype, size



j + geom_pointrange()
x, y, ymin, ymax, alpha, color, fill, group, linetype, shape, size

Mapas

data <- data.frame(murder = USArrests$Murder, state = tolower(rownames(USArrests)))
map <- map_data("state")
k <- ggplot(data, aes(fill = murder))

k + geom_map(aes(map_id = state), map = map**) + expand_limits(**x = map$long, y = map$lat**)**
map_id, alpha, color, fill, linetype, size

Tres Variables

seals$z <- with(seals, sqrt(delta_long^2 + delta_lat^2))
l <- ggplot(seals, aes(long, lat))

l + geom_contour(aes(z = z)**)**
x, y, z, alpha, colour, group, linetype, size, weight

l + geom_raster(aes(fill = z), hjust=0.5, vjust=0.5, interpolate=FALSE**)**
x, y, alpha, fill

l + geom_tile(aes(fill = z)**)**
x, y, alpha, color, fill, linetype, size, width

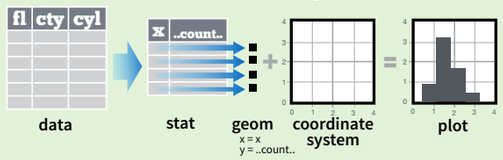
Argumentos

Traducción de argumentos comunes

label = **etiqueta**, angle=**ángulo**
size=**tamaño**, weight=**peso**
alpha=**transparencia**
fontface=**tipo de letra**
hjust=**ajuste horizontal**
lineheight=**grosor de línea**

Stats - Otra manera de construir una capa

Stat crea nuevas variables para la gráfica, como *count*



Cambie el Stat que la función Geom usa para visualizarla, así: **geom_bar(stat="count").** También puede usar la función Stat, así: **stat_count(geom="bar")** que igual como una función Geom, esta función también crea una capa.

función geom · función stat · geométricas

i + stat_density2d(aes(fill = ..level..), geom = "polygon"**)** — variable que stat créa

Distribución Unidimensional

c + stat_bin(binwidth = 1, origin = 10**)**
x, y | ..count.., ..ncount.., ..density.., ..ndensity..
c + stat_count(width = 1**)** x, y, | ..count.., ..prop..
c + stat_density(adjust = 1, kernel = "gaussian"**)**
x, y, | ..count.., ..density.., ..scaled..

Distribución Bidimensional

e + stat_bin_2d(bins = 30, drop = T**)**
x, y, fill | ..count.., ..density..
e + stat_bin_hex(bins=30**)** x, y, fill | ..count.., ..density..
e + stat_density_2d(contour = TRUE, n = 100**)**
x, y, color, size | ..level..
e + stat_ellipse(level = 0.95, segments = 51, type = "t"**)**

l + stat_contour(aes(z = z)**)** x, y, z, order | ..level..
l + stat_summary_hex(aes(z = z), bins = 30, fun = max**)**
x, y, z, fill | ..value..
l + stat_summary_2d(aes(z = z), bins = 30, fun = mean**)**
x, y, z, fill | ..value..

3 Variables

Comparativas

f + stat_boxplot(coef = 1.5**)**
x, y | ..lower.., ..middle.., ..upper.., ..width.. , ..ymin.., ..ymax..
f + stat_ydensity(kernel = "gaussian", scale = "area"**)**
x, y | ..density.., ..scaled.., ..count.., ..n.., ..violinwidth.., ..width..

Funciones

e + stat_ecdf(n = 40**)** x, y | ..x.., ..y..
e + stat_quantile(quantiles = c(0.1, 0.9), formula = y ~ log(x), method = "rq"**)** x, y | ..quantile..
e + stat_smooth(method = "lm", formula = y ~ x, se=T, level=0.95**)** x, y | ..se.., ..x.., ..y.., ..ymin.., ..ymax..

ggplot() + stat_function(aes(x = -3:3), n = 99, fun = dnorm, args = list(sd=0.5)**)** x | ..x.., ..y..
e + stat_identity(na.rm = TRUE**)**
ggplot() + stat_qq(aes(sample=1:100), dist = qt, dparam=list(df=5)**)** sample, x, y | ..sample.., ..theoretical..
e + stat_sum() x, y, size | ..n.., ..prop..
e + stat_summary(fun.data = "mean_cl_boot"**)**
h + stat_summary_bin(fun.y = "mean", geom = "bar"**)**
e + stat_unique()

Todo Uso

Escalas

Las **escalas** asignan los valores que hay en los datos a los valores visuales de una estética.

(n <- d + geom_bar(aes(fill = fl)))

escala · estética afectada · escala del paquete · argumentos de la escala

n + scale_fill_manual(
values = c("skyblue", "royalblue", "blue", "navy"),
limits = c("d", "e", "p", "r"), breaks =c("d", "e", "p", "r"),
name = "fuel", labels = c("D", "E", "P", "R"))

valores permitidos · título del eje · etiqueta de cada valor visible · intervalo de cada valor visible

Escalas para todo uso

Uselas con la mayoría de las estéticas

scale_*_continuous() - asigna valores continuos a visuales
scale_*_discrete() - asigna valores discretos a visuales
scale_*_identity() - crea una estética visual por cada valor
scale_*_manual(values = c()**)** - asigna valores específicos a valores visuales escogidos manualmente.
scale_*_date(date_labels = "%m/%d"), date_breaks = "2 weeks"**)** - Usa los valores como fechas
scale_*_datetime() - Usa los valores como fecha-horas
Igual que **scale_*_date** pero usando **strptime**

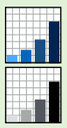
Escalas de localización para X e Y

Use con las estéticas x e y (aquí se muestra x)

scale_x_log10() - Usa escala logarítmica base 10
scale_x_reverse() - Posiciona x al revés
scale_x_sqrt() - Usa escala raíz cuadrada

Escalas para Color y Relleno (Discretas)

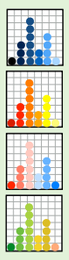
n <- d + geom_bar(aes(fill = fl))



n + scale_fill_brewer(palette = "Blues"**)**
Ver opciones de colores: RColorBrewer::display.brewer.all()
n + scale_fill_grey(start = 0.2, end = 0.8, na.value = "red"**)**

Escalas para Color y Relleno (Continuas)

o <- c + geom_dotplot(aes(fill = ..x..))



o + scale_fill_distiller(palette = "Blues"**)**
o + scale_fill_gradient(low="red", high="yellow"**)**
o + scale_fill_gradient2(low="red", high="blue", mid = "white", midpoint = 25**)**
o + scale_fill_gradientn(colours=topo.colors(6)**)**
También: rainbow(), heat.colors(), terrain.colors(), cm.colors(), RColorBrewer::brewer.pal()

Escalas que usan tamaño y figuras

p <- e + geom_point(aes(shape = fl, size = cyl))

p + scale_shape() + scale_size()
p + scale_shape_manual(values = c(3:7)**)**

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25

p + scale_radius(range = c(1,6)**)**
p + scale_size_area(max_size = 6**)**

Usa el radio o el area

Sistema de Coordenadas

r <- d + geom_bar()

r + coord_cartesian(xlim = c(0, 5)**)**
xlim, ylim
Usa coordenadas cartesianas

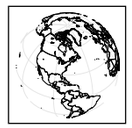
r + coord_fixed(ratio = 1/2**)**
ratio, xlim, ylim
Se fija la relación de aspecto

r + coord_flip()
xlim, ylim
Las coordenadas son volteadas

r + coord_polar(theta = "x", direction=1 **)**
theta, start, direction
Coordenadas polares

r + coord_trans(ytrans = "sqrt"**)**
xtrans, ytrans, limx, limy
xtrans e ytrans se asignan a funciones ventanas para transformar las coordenadas cartesianas

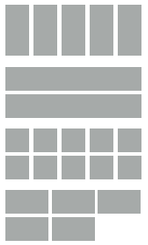
π + coord_quickmap()
π + coord_map(projection = "ortho", orientation=c(41, -74, 0)**)**
projection, orientation, xlim, ylim
Usa el paquete mapproj para proyectar mapas



Facetas

Las Facetas dividen una gráfica en multiple sub-gráficas basada en una o varias variables discretas

t <- ggplot(mpg, aes(cty, hwy)) + geom_point()



t + facet_grid(. ~ fl)
usa fl para dividir en columnas
t + facet_grid(year ~ .)
usa year para dividir en lineas
t + facet_grid(year ~ fl)
usa los dos para dividir
t + facet_wrap(~ fl)
divide en una manera rectangular

Use **scales** para que dejar que el límite cambie por cada faceta

t + facet_grid(drv ~ fl, scales = "free")
Cada faceta tiene limites x e y indpendientes
- **"free_x"** - ajusta el límite del eje x
- **"free_y"** - ajusta el límite del eje y

Use **labeller** para cambiar las etiquetas de las facetas

t + facet_grid(. ~ fl, labeller = label_both)

fl: c	fl: d	fl: e	fl: p	fl: r

t + facet_grid(fl ~ ., labeller = label_bquote(alpha ^ .(fl)**))**

α^c	α^d	α^e	α^p	α^r

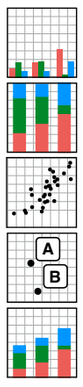
t + facet_grid(. ~ fl, labeller = label_parsed)

c	d	e	p	r

Ajustes a las posiciones

Determina que hacer con Geoms que ocuparían la misma posición en la gráfica.

s <- ggplot(mpg, aes(fl, fill = drv))



s + geom_bar(position = "dodge")
Pone los elementos a lado de cada uno
s + geom_bar(position = "fill")
Pone los elementos encima the cada uno y usa toda la altura de la gráfica
e + geom_point(position = "jitter")
Agrega ruido a los elementos
e + geom_label(position = "nudge")
Empuja las letras para ver los puntos
s + geom_bar(position = "stack")
Pone los elementos encima the cada uno

Cada ajuste se puede usar como función para fijar el ancho and alto

s + geom_bar(position = position_dodge(width = 1))

Etiquetas

t + labs(x = "Etiqueta X", y = "Etiqueta Y",
title ="Título de la gráfica",
subtitle = "Subtítulo de la gráfica",
caption = "Nota de la gráfica",
<AES> = "Texto in la <AES> "**)**

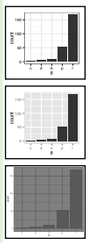
Use funciones escalas para controlar las etiquetas de las leyendas

t + annotate(geom = "text", x = 8, y = 9, label = "A"**)**
Anotaciones · geom a usar · valores manuales del geom

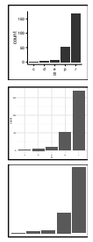
Leyendas

n + theme(legend.position = "bottom"**)**
Pone la leyenda debajo (bottom), arriba(top), izquierda (left), o derecha (right)
n + guides(fill = "none"**)**
Tipo de leyenda por cada estética : colorbar, legend, or none (no legend)
n + scale_fill_discrete(name = "Title", labels = c("A", "B", "C", "D", "E"**)**
Fija el título y etiquetas de la leyenda

Tema

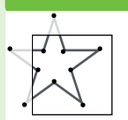


r + theme_bw()
Fondo blanco con cuadrícula
r + theme_gray()
Fondo gris (tema inicial)
r + theme_dark()
Obscuro



r + theme_classic()
r + theme_light()
r + theme_linedraw()
r + theme_minimal()
Temas minimalisticos
r + theme_void()
Tema vacío

Agrandar una sección



Sin cortar (preferido)
t + coord_cartesian(xlim = c(0, 100), ylim = c(10, 20)**)**

Cortando (quita los puntos escondidos)

t + xlim(0, 100**) + ylim(**10, 20**)**
t + scale_x_continuous(limits = c(0, 100)**) + scale_y_continuous(**limits = c(0, 100)**)**