

Graphic Design with ggplot2

Working with Layouts and Composition

Cédric Scherer // rstudio::conf // July 2022

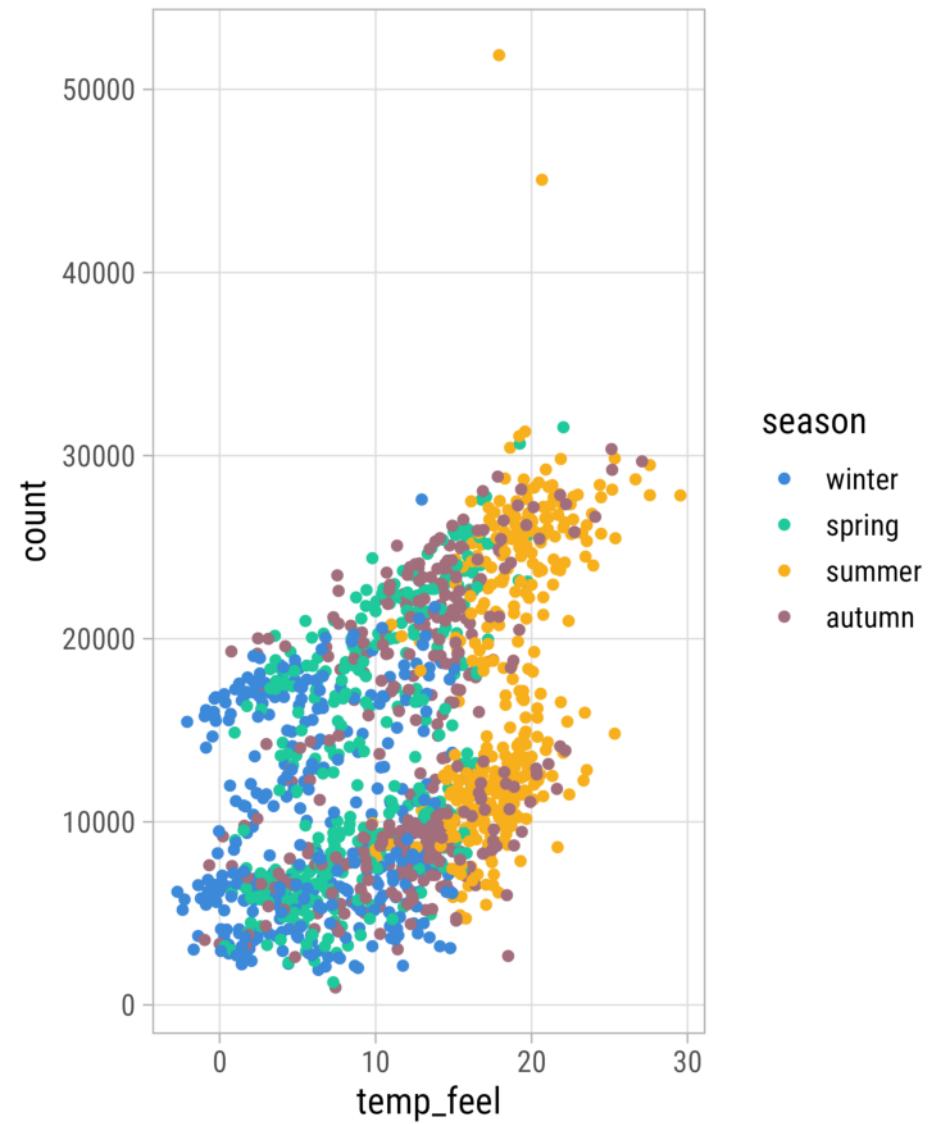
Setup

```
1 library(tidyverse)
2
3 bikes <- readr::read_csv(
4   here::here("data", "london-bikes-custom.csv"),
5   col_types = "Dcffffillllddddc"
6 )
7
8 bikes$season <- forcats::fct_inorder(bikes$season)
9
10 theme_set(theme_light(base_size = 14, base_family = "Roboto Condensed"))
11
12 theme_update(
13   panel.grid.minor = element_blank(),
14   plot.title = element_text(face = "bold"),
15   plot.title.position = "plot"
16 )
```

Legend Placement and Styling

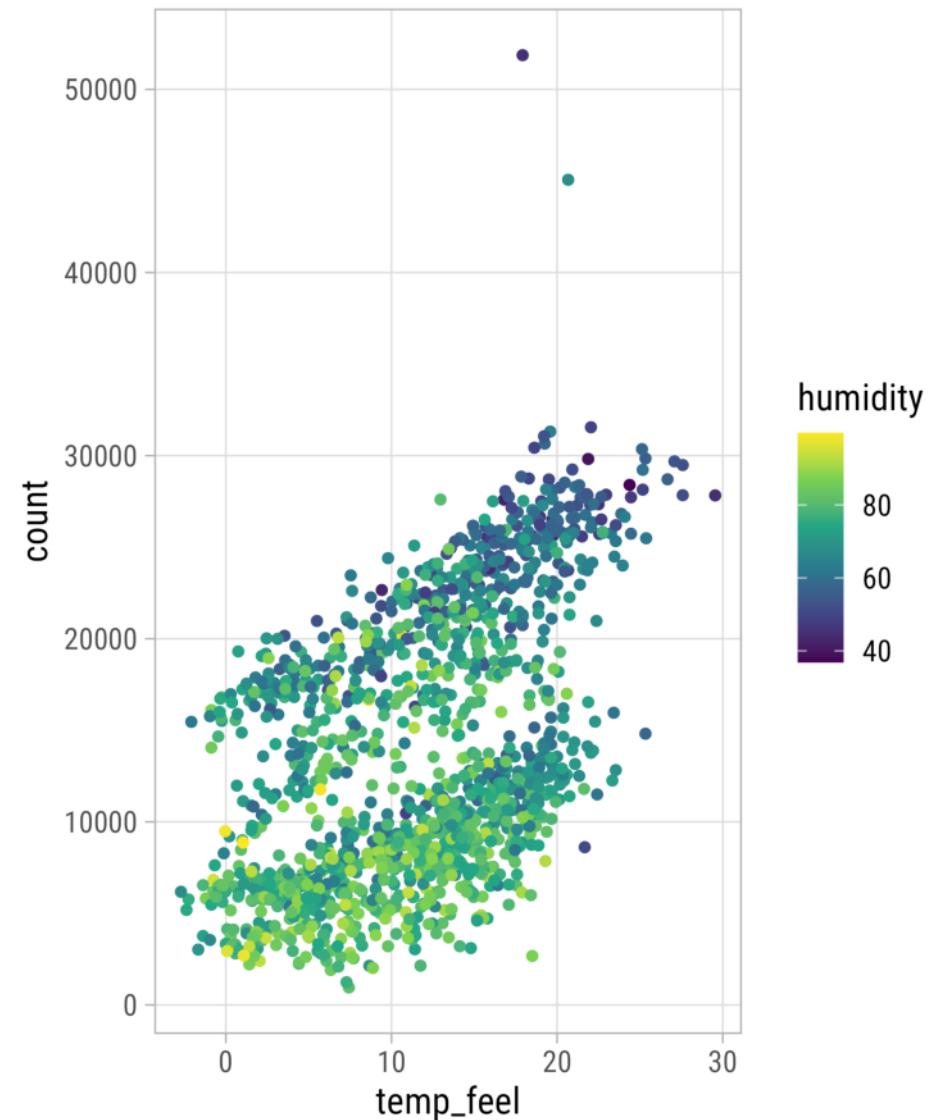
Discrete Legend

```
1 pal <- c("#3c89d9", "#1ec99b", "#F7B01B", "#a25129")
2
3 ggplot(
4   bikes,
5   aes(x = temp_feel, y = count,
6        color = season)
7 ) +
8   geom_point() +
9   scale_color_manual(values = pal)
```



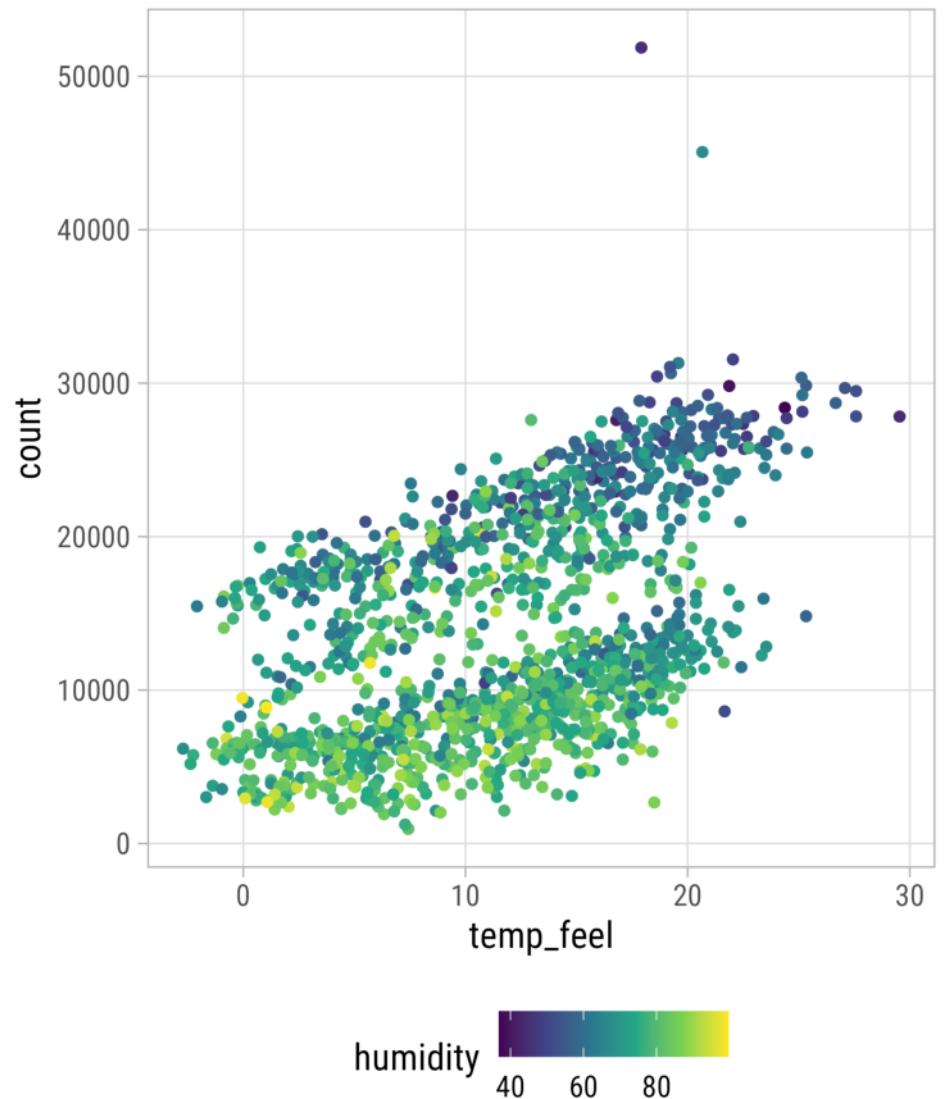
Continuous Legend

```
1 ggplot(  
2   bikes,  
3   aes(x = temp_feel, y = count,  
4       color = humidity)  
5 ) +  
6 geom_point() +  
7 scale_color_viridis_c()
```



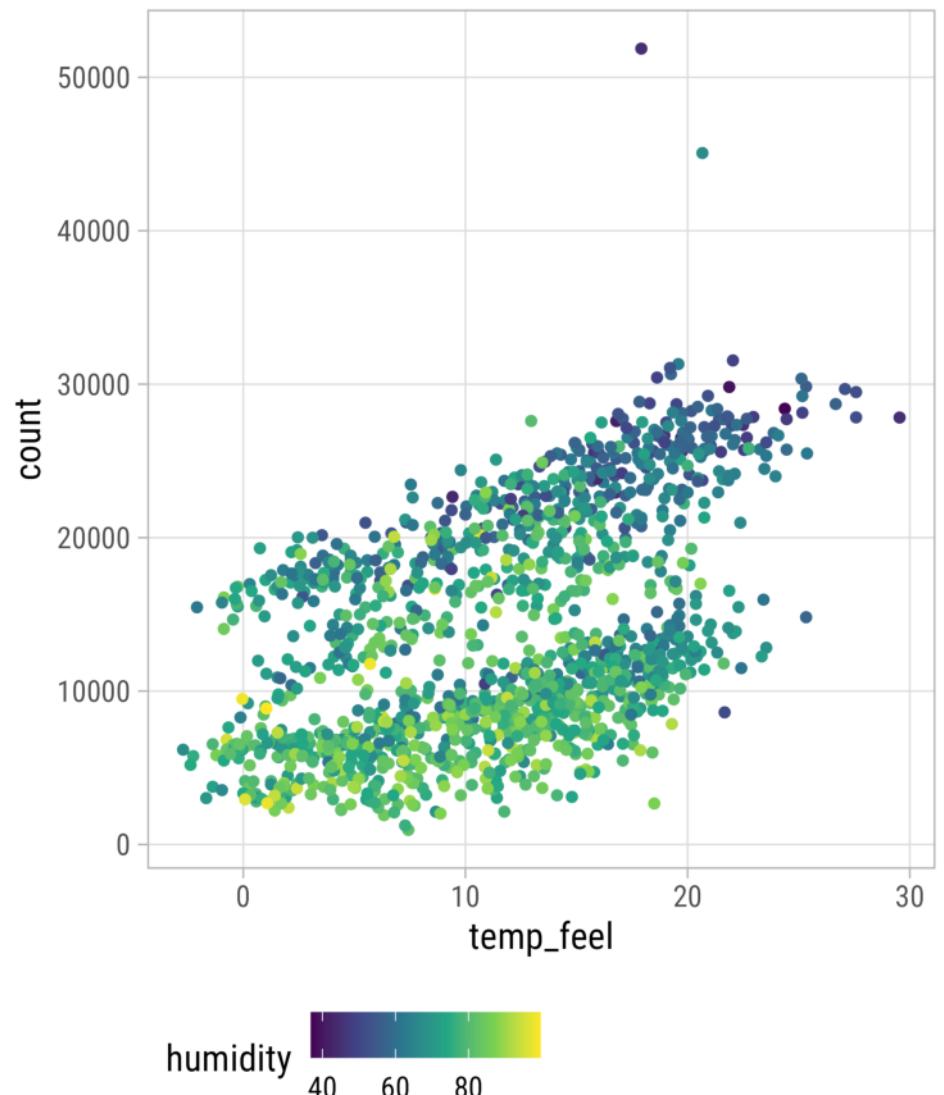
Legend Position

```
1 ggplot(  
2   bikes,  
3   aes(x = temp_feel, y = count,  
4       color = humidity)  
5 ) +  
6 geom_point() +  
7 scale_color_viridis_c() +  
8 theme(  
9   legend.position = "bottom"  
10 )
```



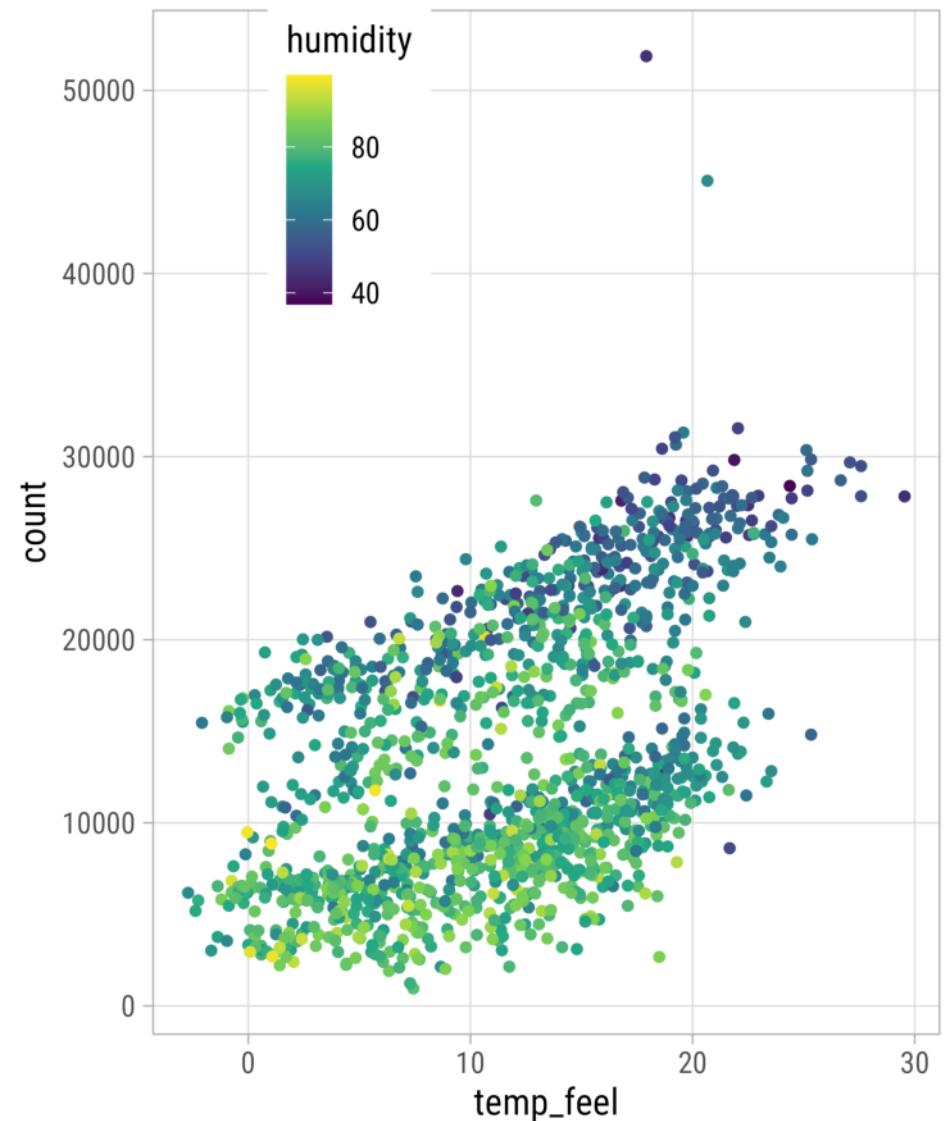
Legend Justification

```
1 ggplot(  
2   bikes,  
3   aes(x = temp_feel, y = count,  
4       color = humidity)  
5 ) +  
6 geom_point() +  
7 scale_color_viridis_c() +  
8 theme(  
9   legend.position = "bottom",  
10  legend.justification = "left"  
11 )
```



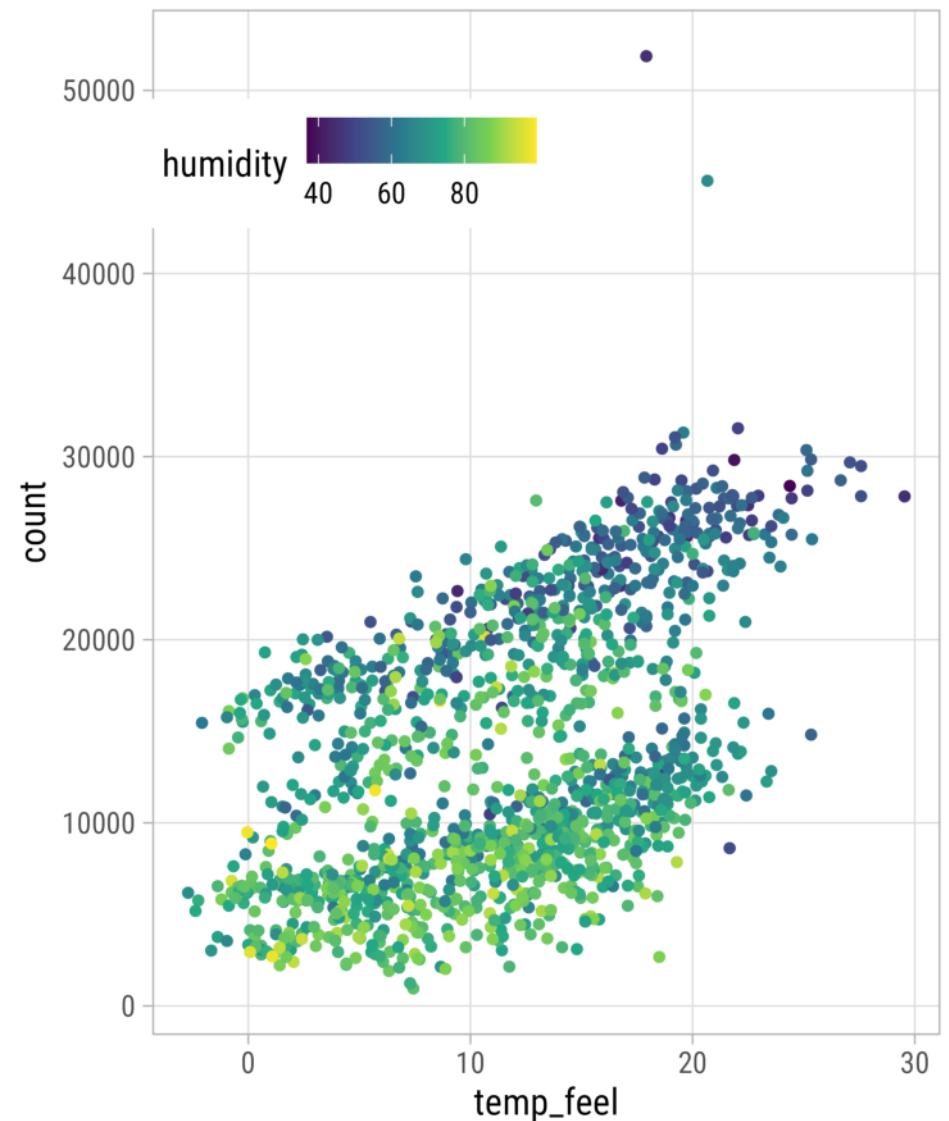
Legend Position

```
1 ggplot(  
2   bikes,  
3   aes(x = temp_feel, y = count,  
4       color = humidity)  
5 ) +  
6 geom_point() +  
7 scale_color_viridis_c() +  
8 theme(  
9   legend.position = c(.25, .85)  
10 )
```



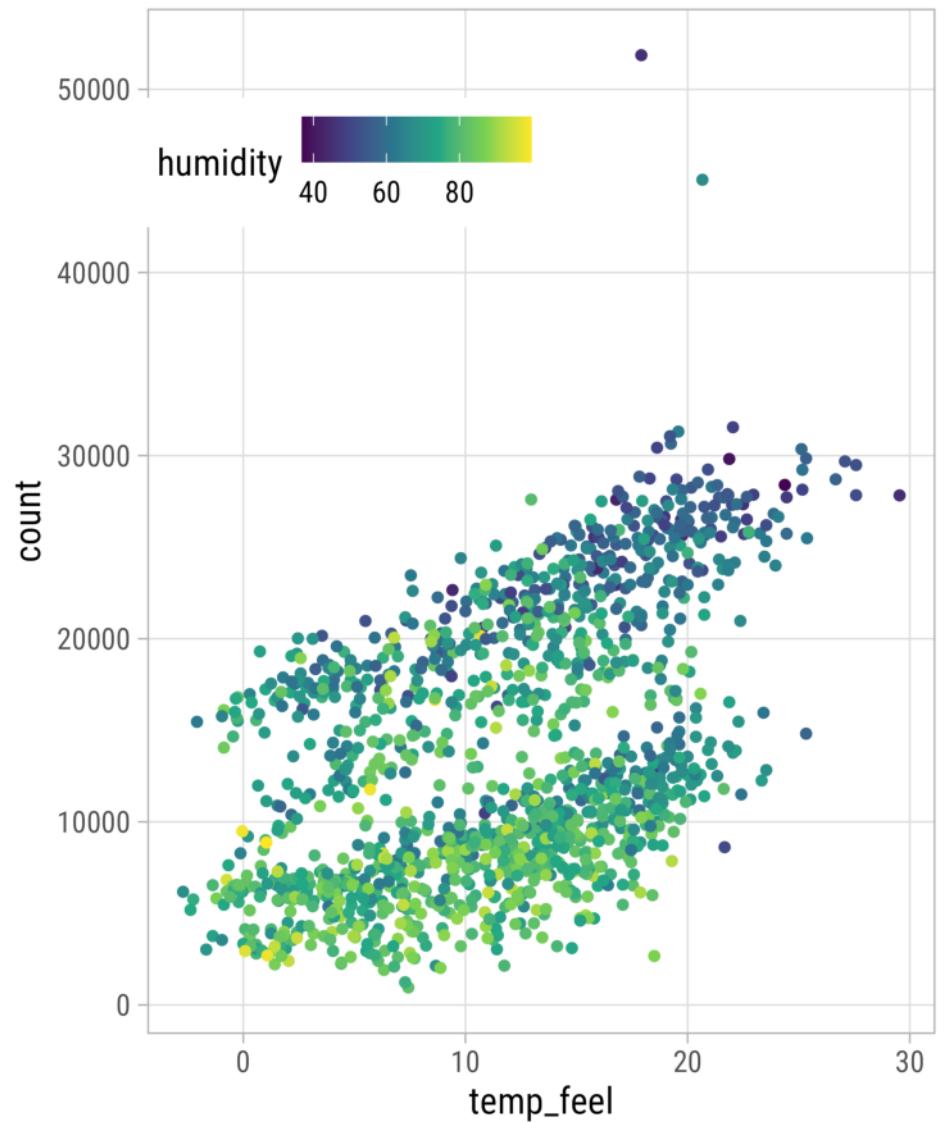
Legend Direction

```
1 ggplot(  
2   bikes,  
3   aes(x = temp_feel, y = count,  
4       color = humidity)  
5 ) +  
6 geom_point() +  
7 scale_color_viridis_c() +  
8 theme(  
9   legend.position = c(.25, .85),  
10  legend.direction = "horizontal"  
11 )
```



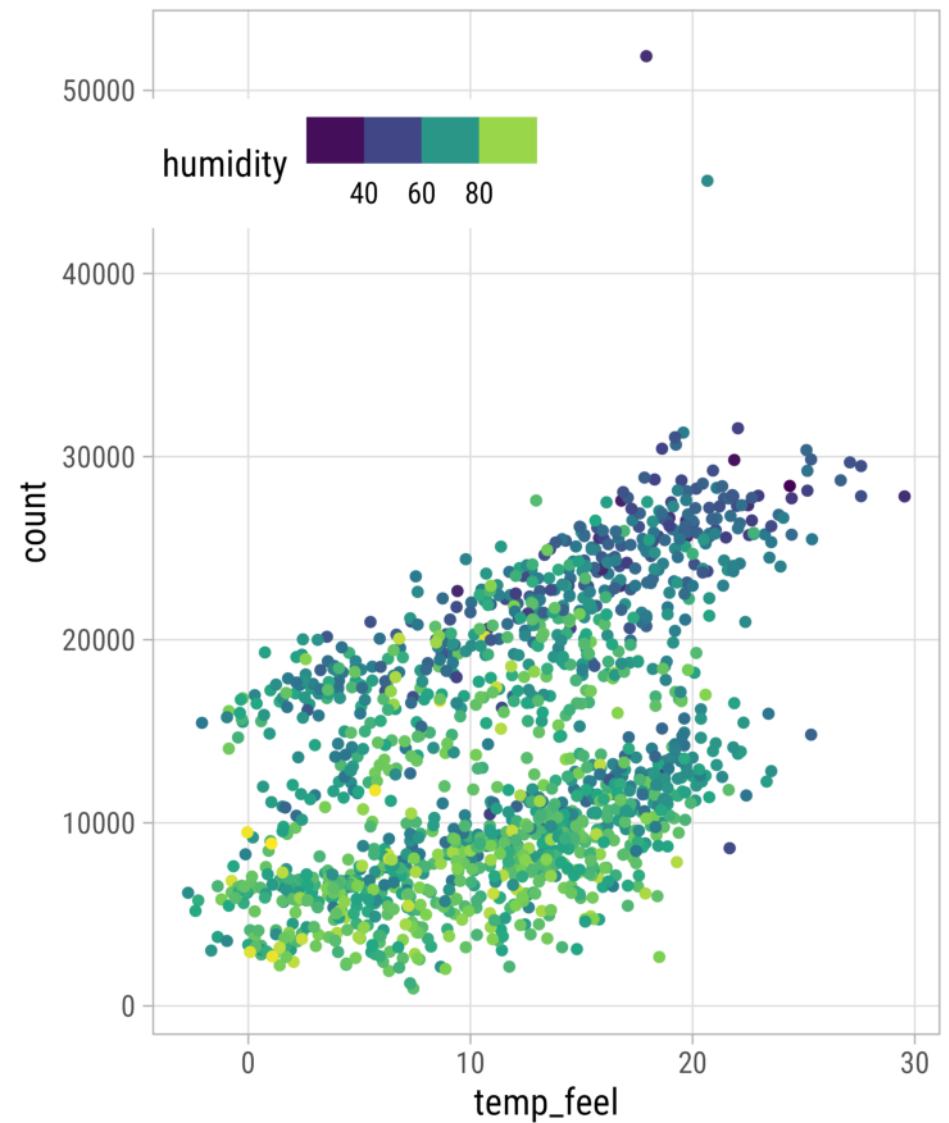
Legend Types

```
1 ggplot(  
2   bikes,  
3   aes(x = temp_feel, y = count,  
4       color = humidity)  
5 ) +  
6   geom_point() +  
7   scale_color_viridis_c(  
8     guide = "colorbar"  
9 ) +  
10 theme(  
11   legend.position = c(.25, .85),  
12   legend.direction = "horizontal"  
13 )
```



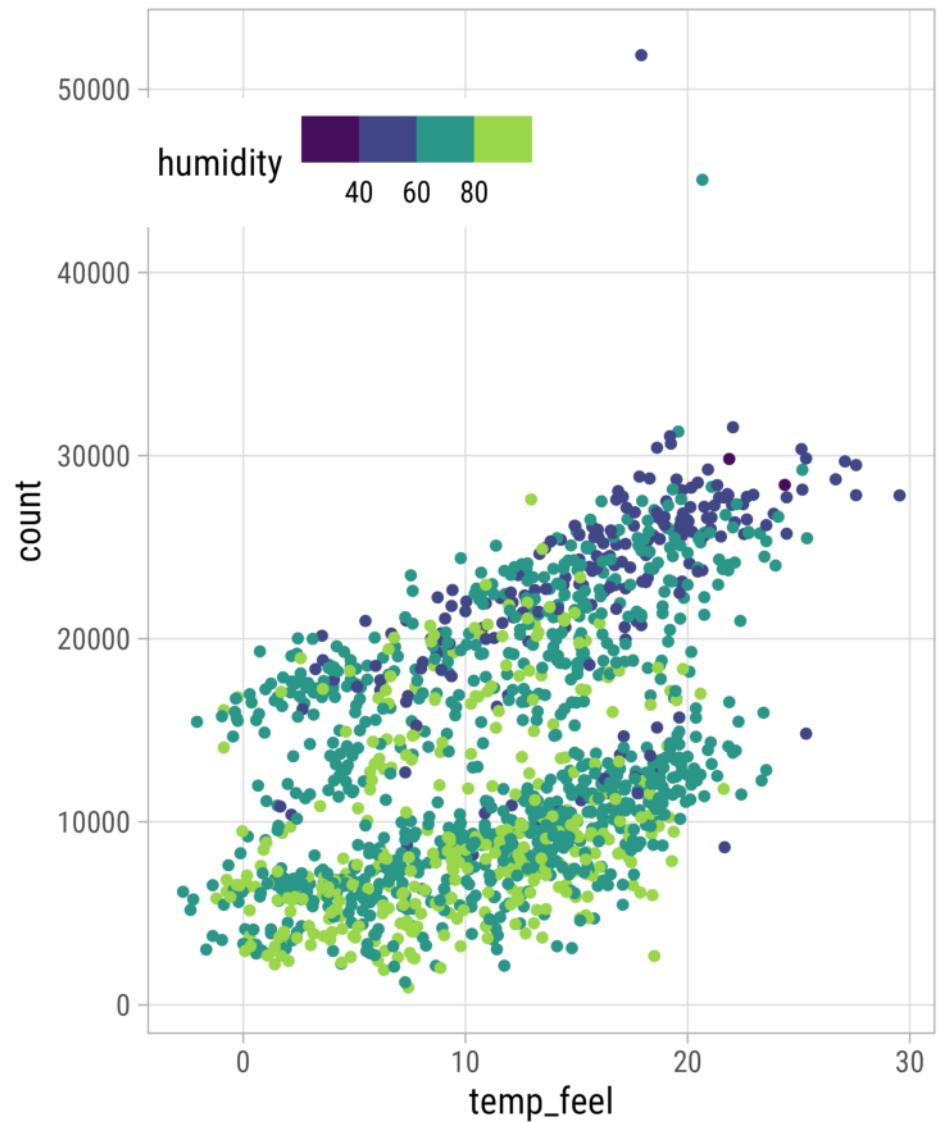
Legend Types

```
1 ggplot(  
2   bikes,  
3   aes(x = temp_feel, y = count,  
4       color = humidity)  
5 ) +  
6   geom_point() +  
7   scale_color_viridis_c(  
8     guide = "colorsteps"  
9 ) +  
10 theme(  
11   legend.position = c(.25, .85),  
12   legend.direction = "horizontal"  
13 )
```



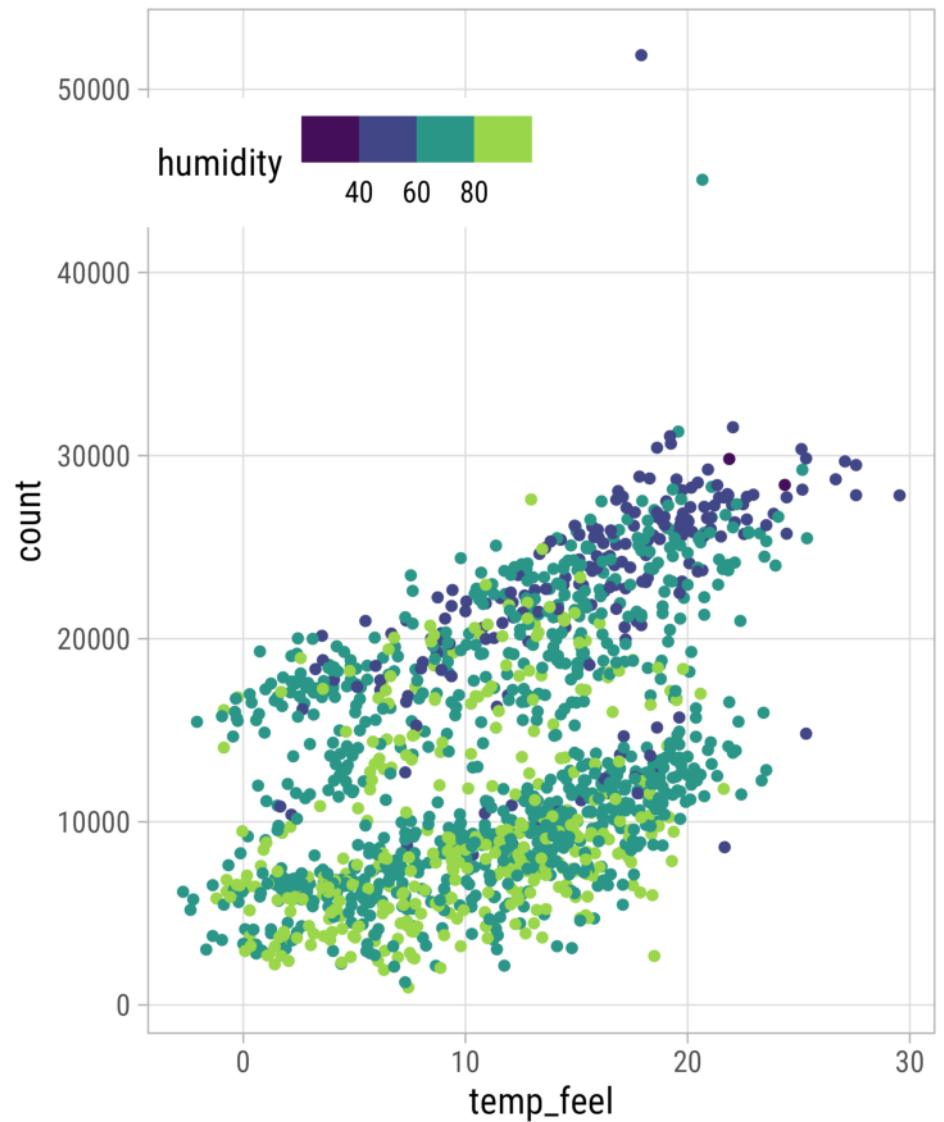
Legend Types

```
1 ggplot(  
2   bikes,  
3   aes(x = temp_feel, y = count,  
4       color = humidity)  
5 ) +  
6   geom_point() +  
7   scale_color_viridis_b(  
8     guide = "colorsteps"  
9 ) +  
10 theme(  
11   legend.position = c(.25, .85),  
12   legend.direction = "horizontal"  
13 )
```



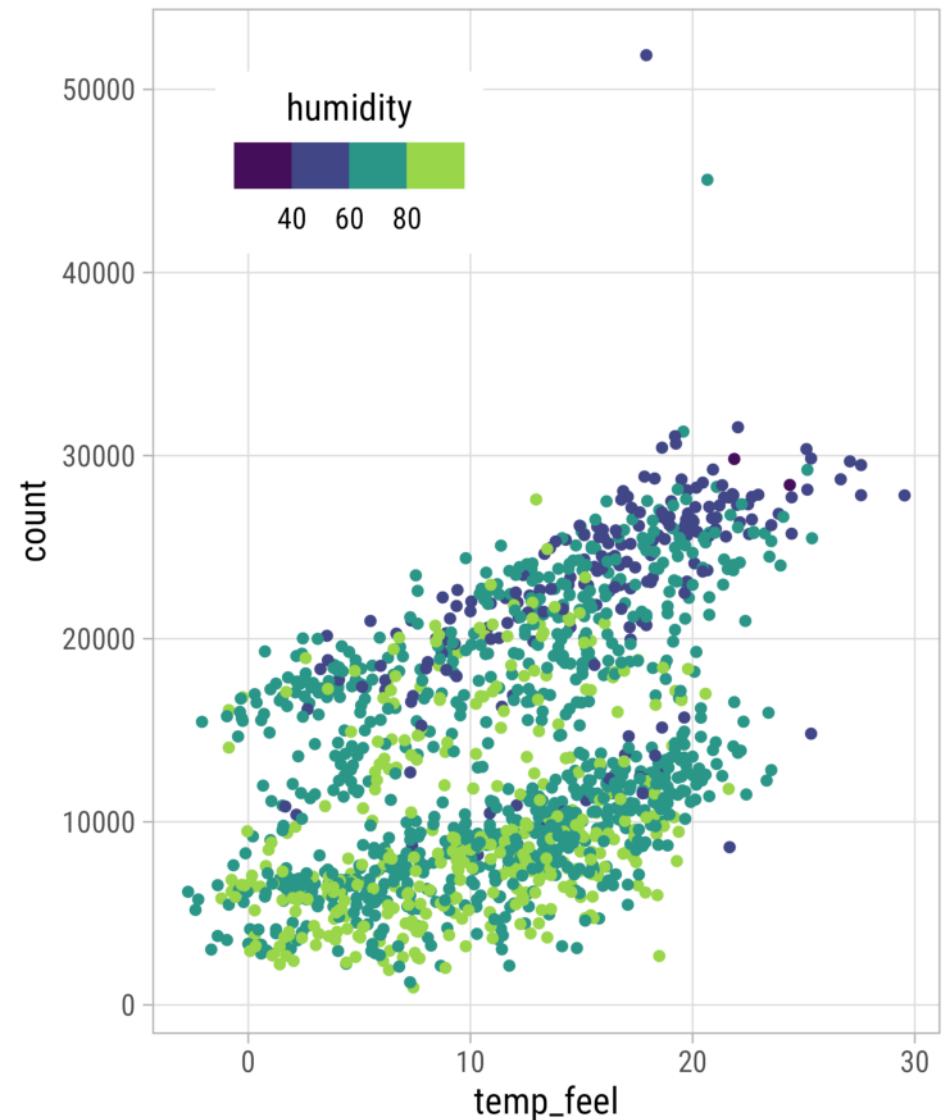
Legend Types

```
1 ggplot(  
2   bikes,  
3   aes(x = temp_feel, y = count,  
4       color = humidity)  
5 ) +  
6   geom_point() +  
7   scale_color_viridis_b(  
8     guide = guide_colorsteps()  
9 ) +  
10 theme(  
11   legend.position = c(.25, .85),  
12   legend.direction = "horizontal"  
13 )
```



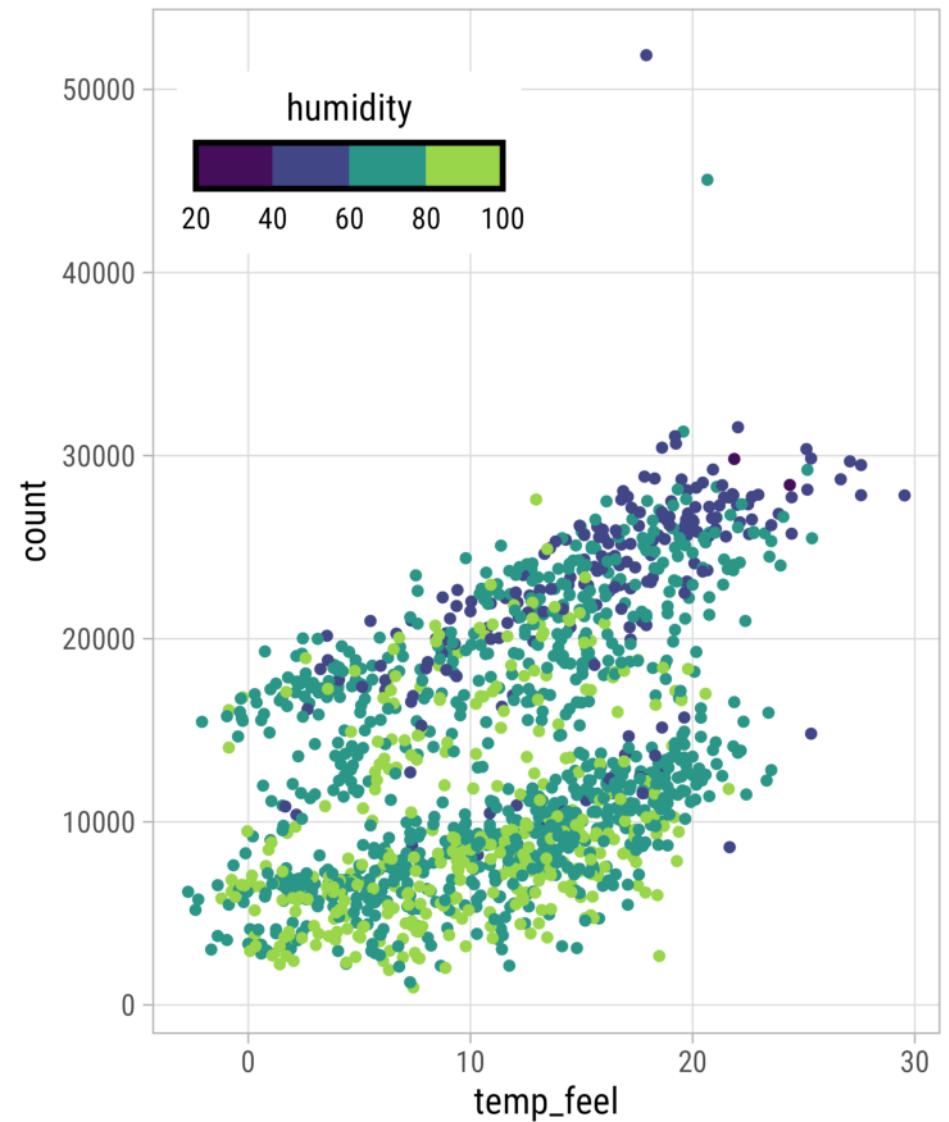
Legend Styling

```
1 ggplot(  
2   bikes,  
3   aes(x = temp_feel, y = count,  
4       color = humidity)  
5 ) +  
6   geom_point() +  
7   scale_color_viridis_b(  
8     guide = guide_colorsteps(  
9       title.position = "top",  
10      title.hjust = .5  
11    )  
12  ) +  
13  theme(  
14    legend.position = c(.25, .85),  
15    legend.direction = "horizontal"  
16  )
```



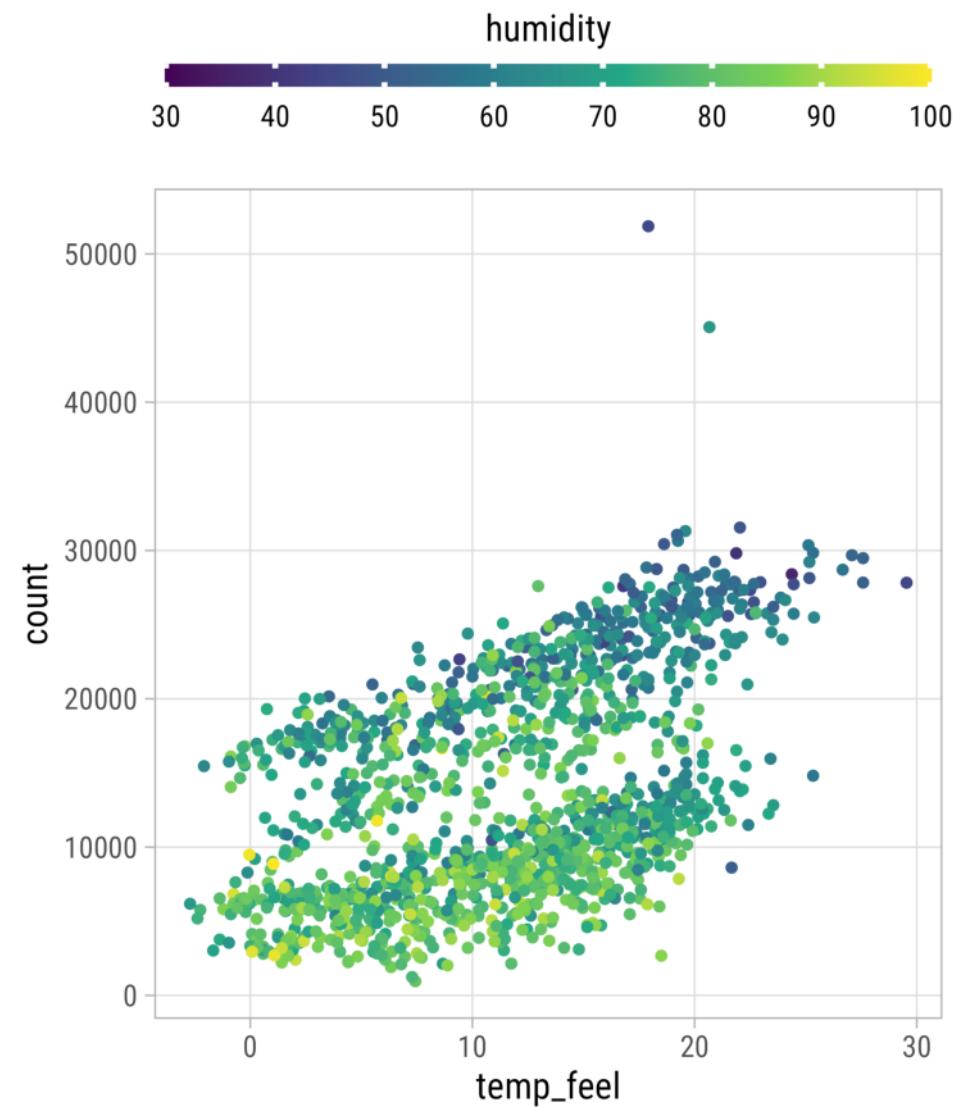
Legend Styling

```
1 ggplot(  
2   bikes,  
3   aes(x = temp_feel, y = count,  
4       color = humidity)  
5 ) +  
6   geom_point() +  
7   scale_color_viridis_b(  
8     guide = guide_colorsteps(  
9       title.position = "top",  
10      title.hjust = .5,  
11      show.limits = TRUE,  
12      frame.colour = "black",  
13      frame.linewidth = 3,  
14      barwidth = unit(8, "lines")  
15    )  
16  ) +  
17  theme(  
18    legend.position = c(.25, .85),  
19    legend.direction = "horizontal"  
20  )
```



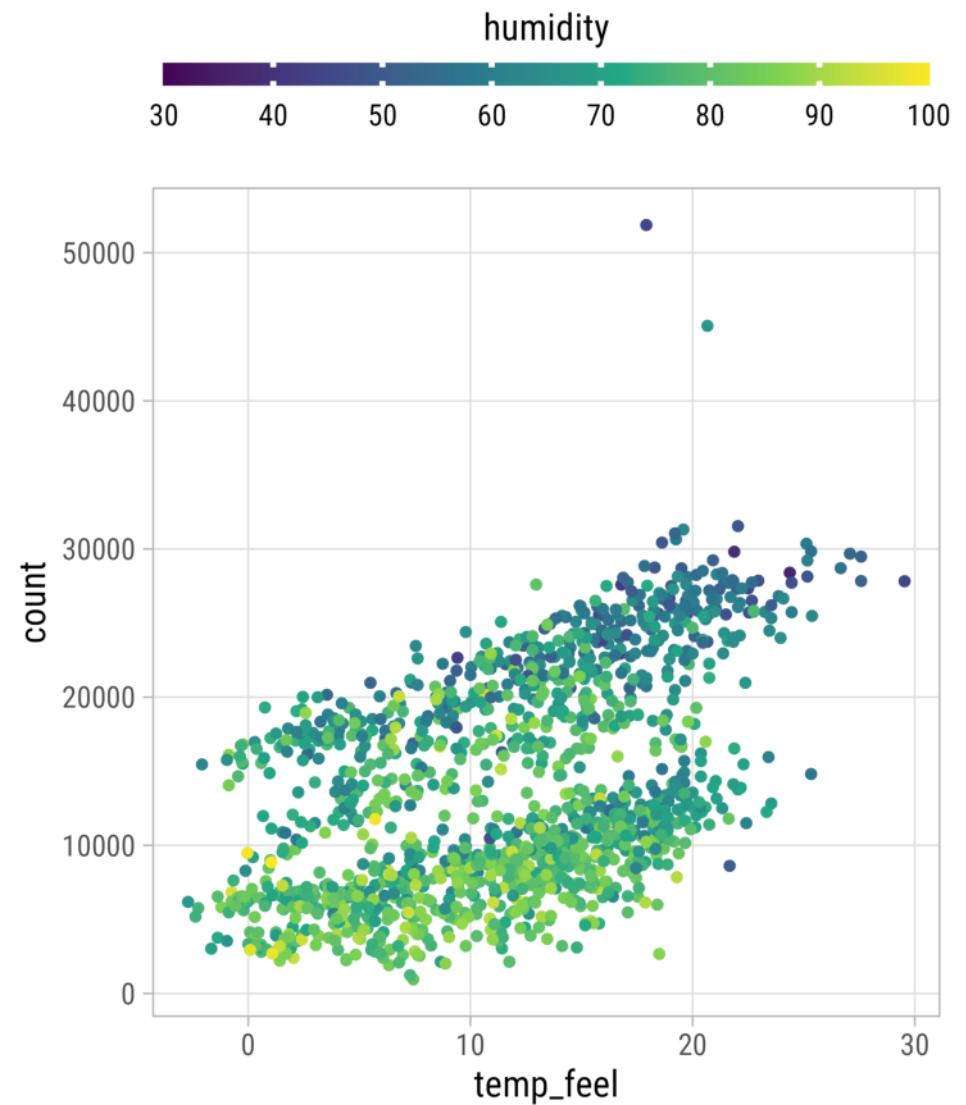
Legend Styling

```
1 ggplot(  
2   bikes,  
3   aes(x = temp_feel, y = count,  
4       color = humidity)  
5 ) +  
6   geom_point() +  
7   scale_color_viridis_c(  
8     breaks = 3:10*10,  
9     limits = c(30, 100),  
10    guide = guide_colorbar(  
11      title.position = "top",  
12      title.hjust = .5,  
13      ticks.linewidth = 3,  
14      barwidth = unit(20, "lines"),  
15      barheight = unit(.6, "lines")  
16    )  
17  ) +  
18  theme(  
19    legend.position = "top"  
20  )
```



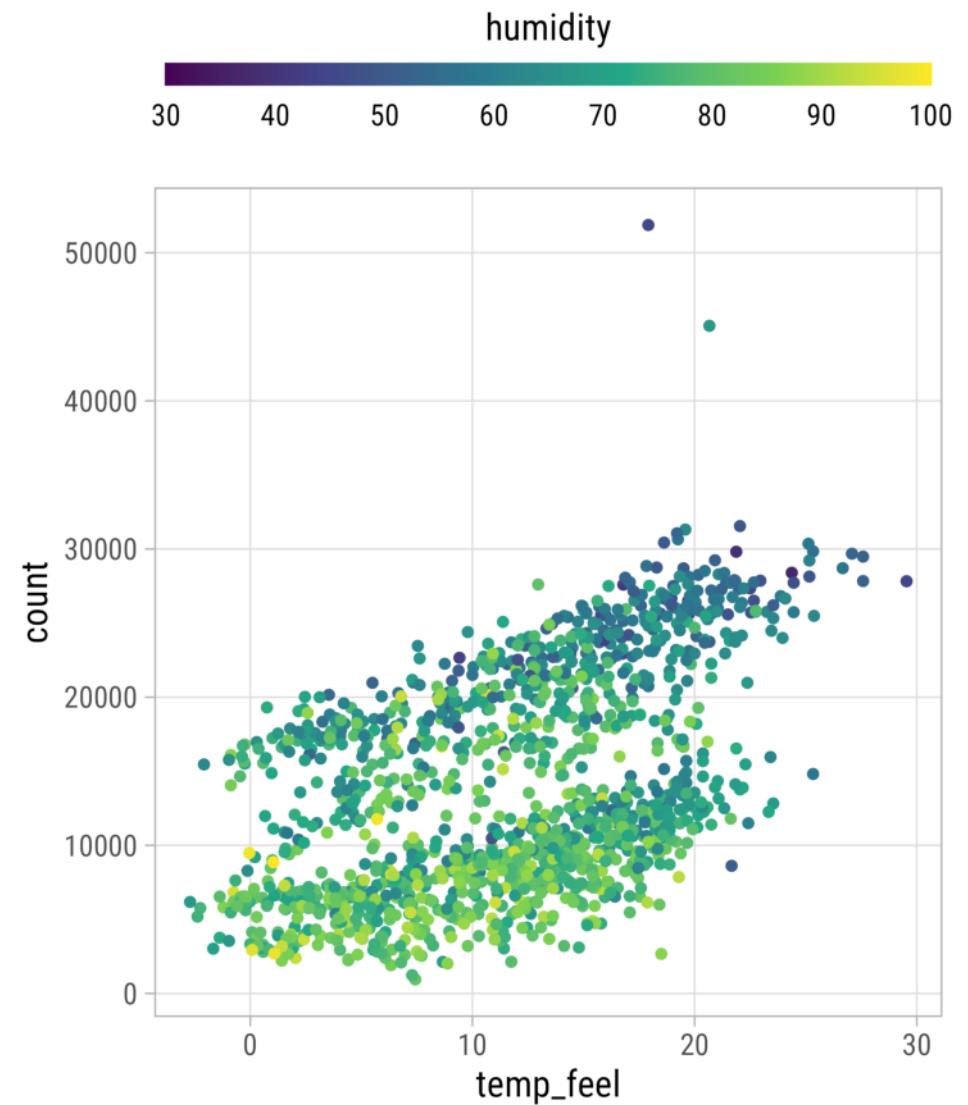
Legend Styling

```
1 ggplot(  
2   bikes,  
3   aes(x = temp_feel, y = count,  
4       color = humidity)  
5 ) +  
6   geom_point() +  
7   scale_color_viridis_c(  
8     breaks = 3:10*10,  
9     limits = c(30, 100),  
10    guide = guide_colorbar(  
11      title.position = "top",  
12      title.hjust = .5,  
13      ticks.linewidth = 3,  
14      draw.ulim = FALSE,  
15      draw.llim = FALSE,  
16      barwidth = unit(20, "lines"),  
17      barheight = unit(.6, "lines")  
18    )  
19  ) +  
20  theme(  
21    legend.position = "top"  
22  )
```



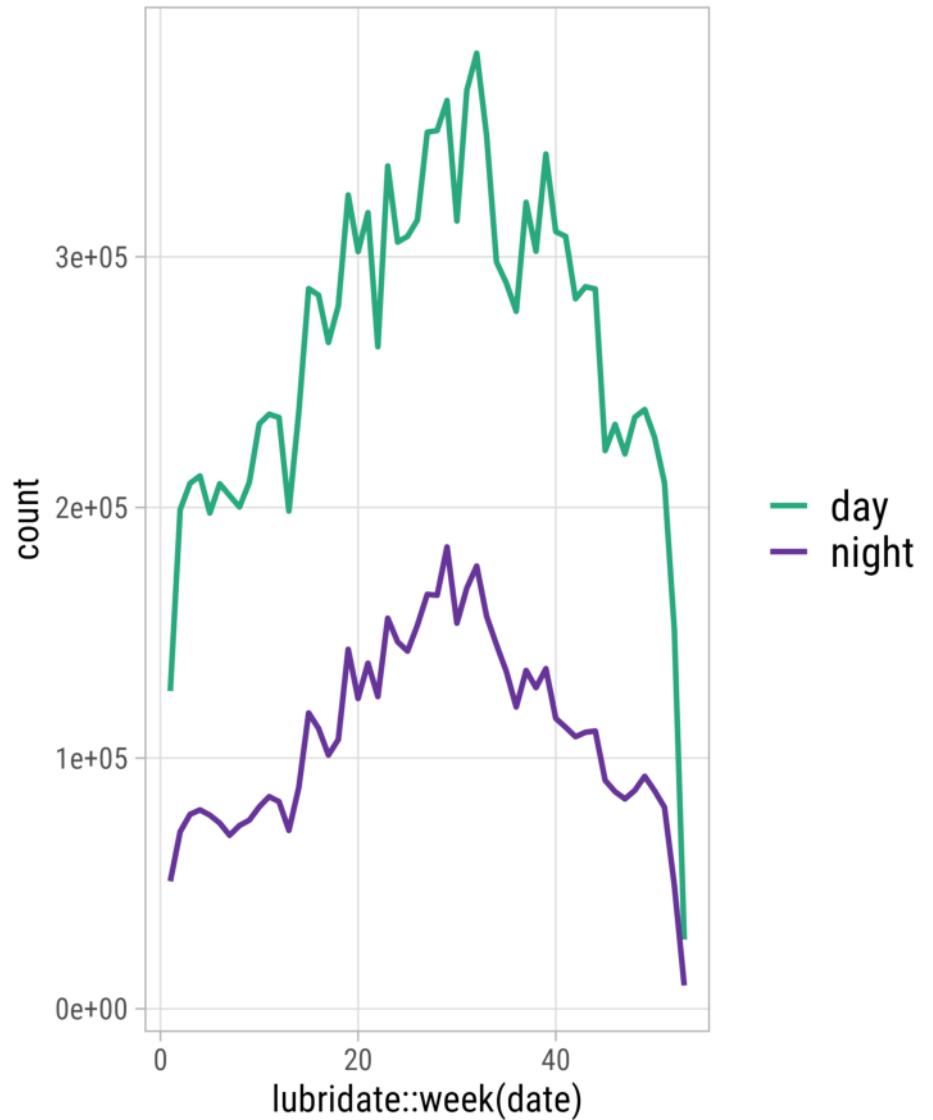
Legend Styling

```
1 ggplot(  
2   bikes,  
3   aes(x = temp_feel, y = count,  
4       color = humidity)  
5 ) +  
6   geom_point() +  
7   scale_color_viridis_c(  
8     breaks = 3:10*10,  
9     limits = c(30, 100),  
10    guide = guide_colorbar(  
11      title.position = "top",  
12      title.hjust = .5,  
13      ticks = FALSE,  
14      barwidth = unit(20, "lines"),  
15      barheight = unit(.6, "lines")  
16    )  
17  ) +  
18  theme(  
19    legend.position = "top"  
20  )
```



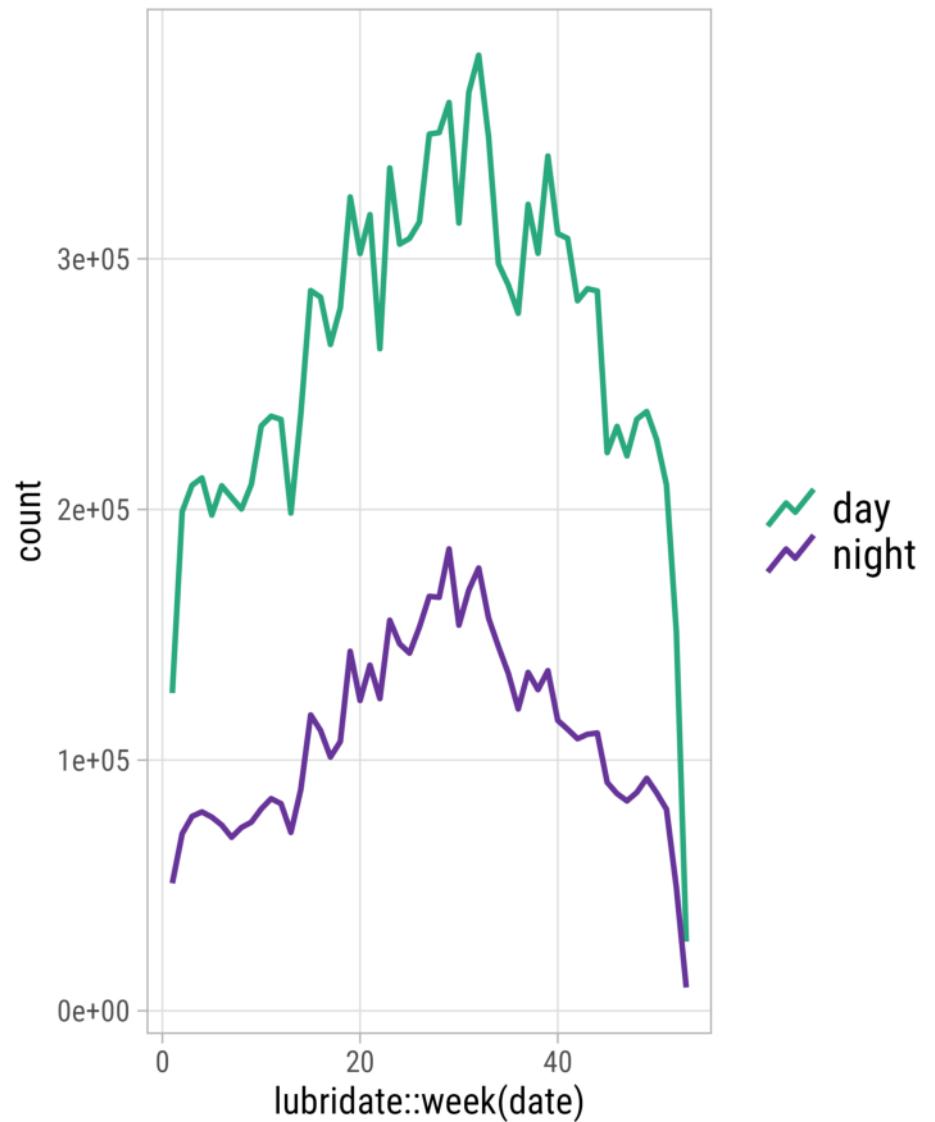
Key Glyphs

```
1 ggplot(  
2   bikes,  
3   aes(x = lubridate::week(date),  
4     y = count,  
5     color = day_night)  
6 ) +  
7   stat_summary(  
8     geom = "line",  
9     fun = sum,  
10    size = 1  
11 ) +  
12   scale_color_manual(  
13     values = c("#28A87D", "#663399"),  
14     name = NULL  
15 ) +  
16   theme(  
17     legend.text = element_text(size = 16)  
18 )
```



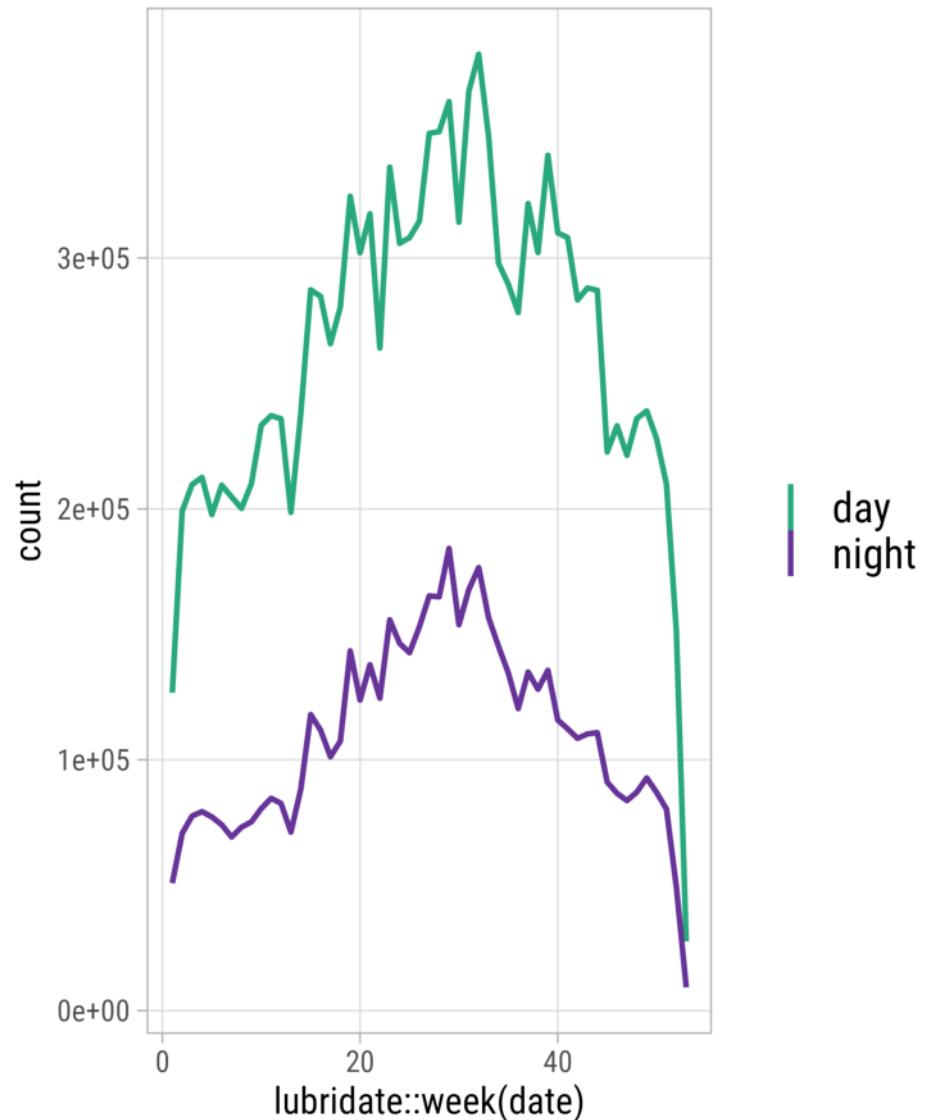
Key Glyphs

```
1 ggplot(  
2   bikes,  
3   aes(x = lubridate::week(date),  
4     y = count,  
5     color = day_night)  
6 ) +  
7   stat_summary(  
8     geom = "line",  
9     fun = sum,  
10    key_glyph = "timeseries",  
11    size = 1  
12 ) +  
13   scale_color_manual(  
14     values = c("#28A87D", "#663399"),  
15     name = NULL  
16 ) +  
17   theme(  
18     legend.text = element_text(size = 16)  
19 )
```



Key Glyphs

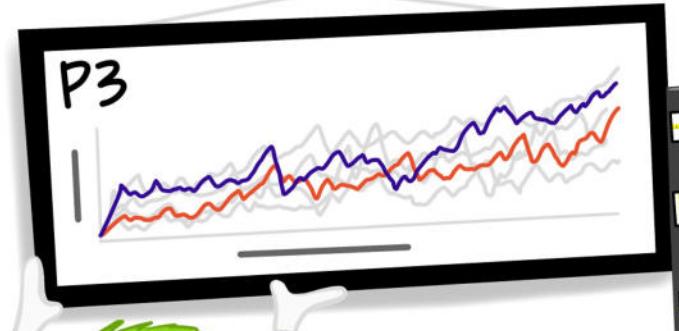
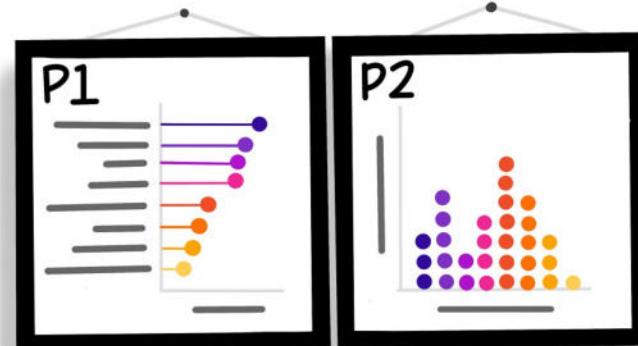
```
1 ggplot(  
2   bikes,  
3   aes(x = lubridate::week(date),  
4     y = count,  
5     color = day_night)  
6 ) +  
7   stat_summary(  
8     geom = "line",  
9     fun = sum,  
10    key_glyph = "vline",  
11    size = 1  
12 ) +  
13   scale_color_manual(  
14     values = c("#28A87D", "#663399"),  
15     name = NULL  
16 ) +  
17   theme(  
18     legend.text = element_text(size = 16)  
19 )
```



Composing ggplot's

patchwork

Combine + arrange
your ggplots!



PLAN:
 $(P1+P2)/P3$

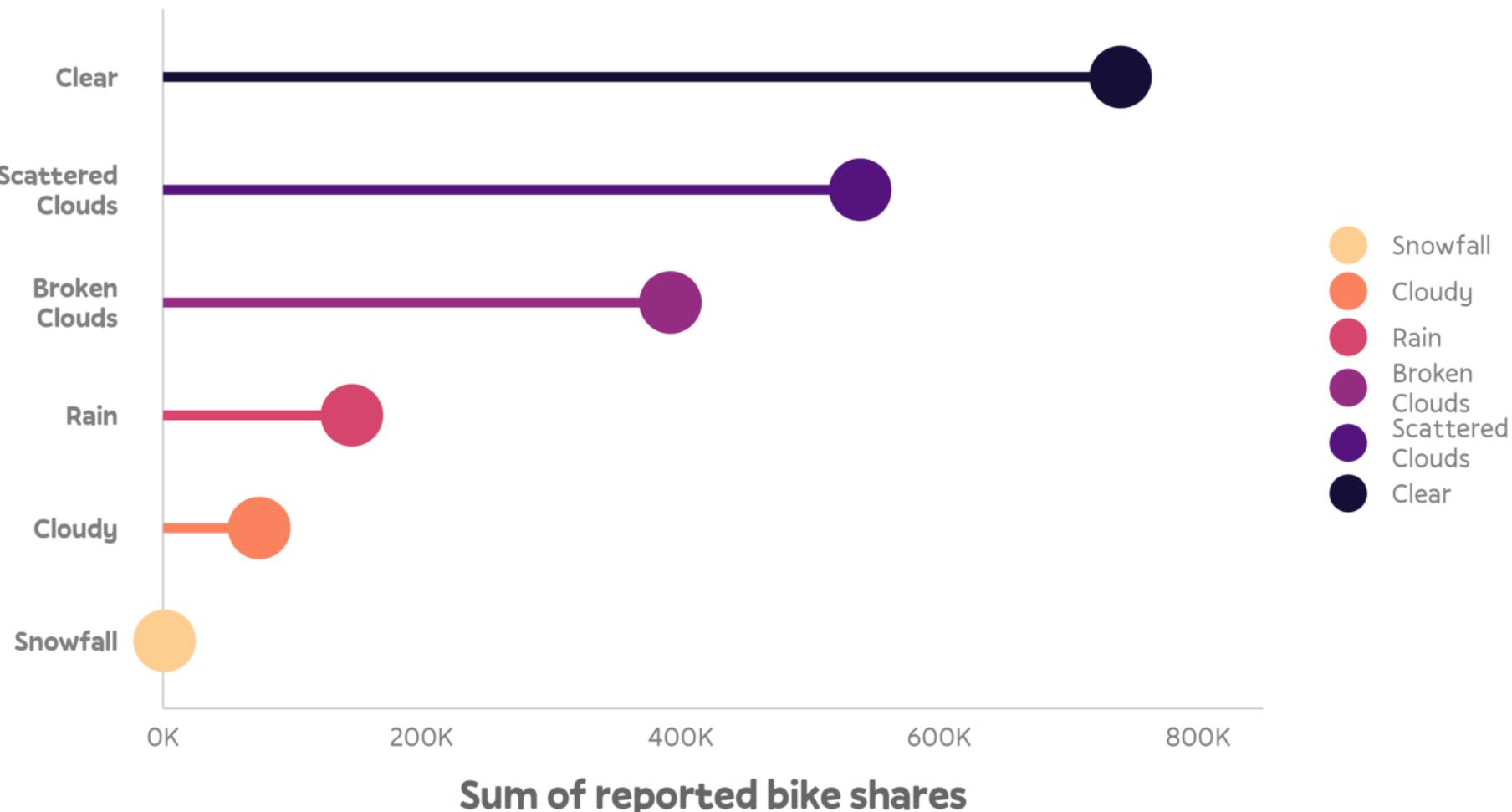
P1 P2
P3



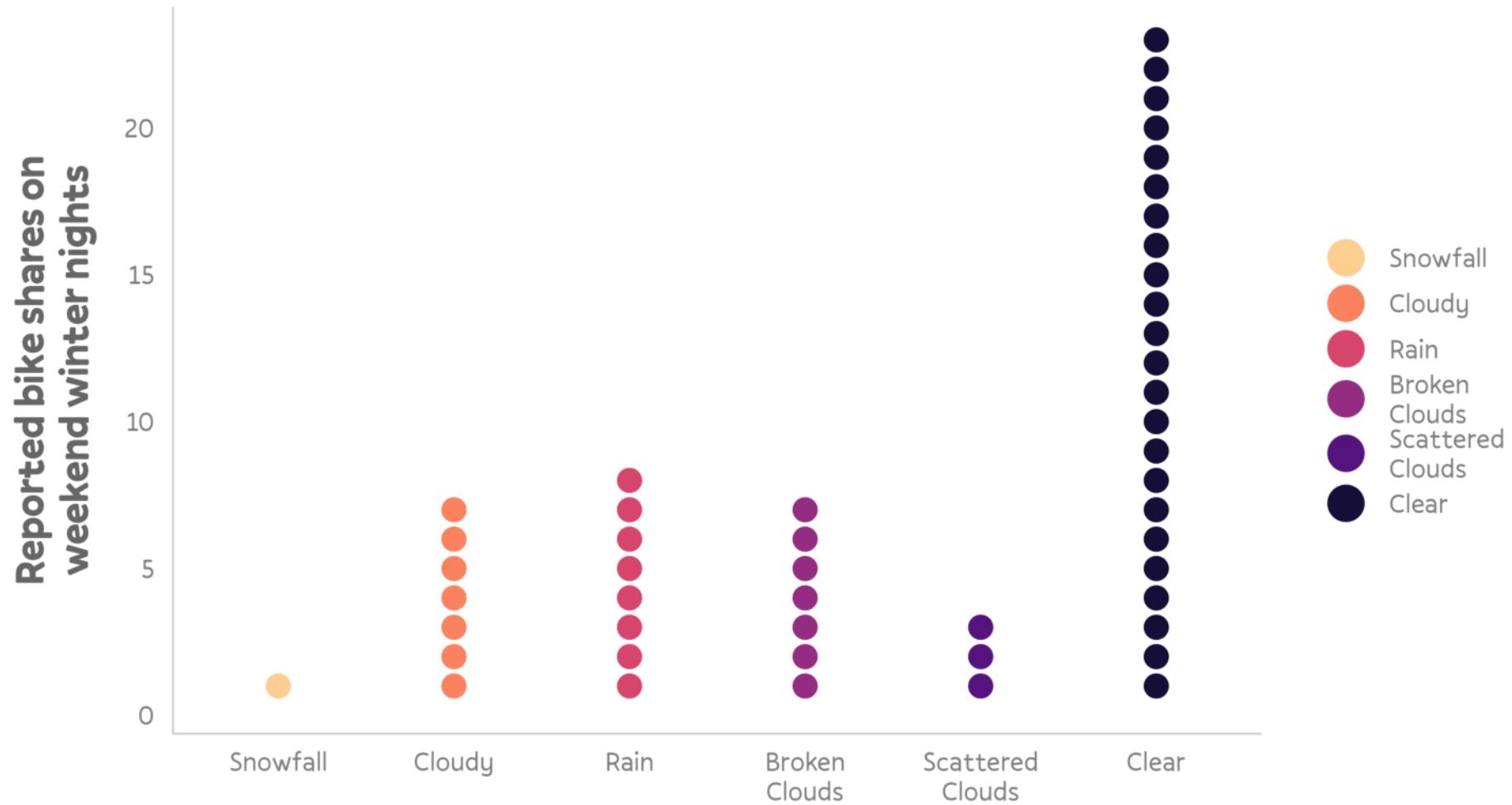
Illustration by Allison Horst

Cédric Scherer // rstudio::conf // July 2022

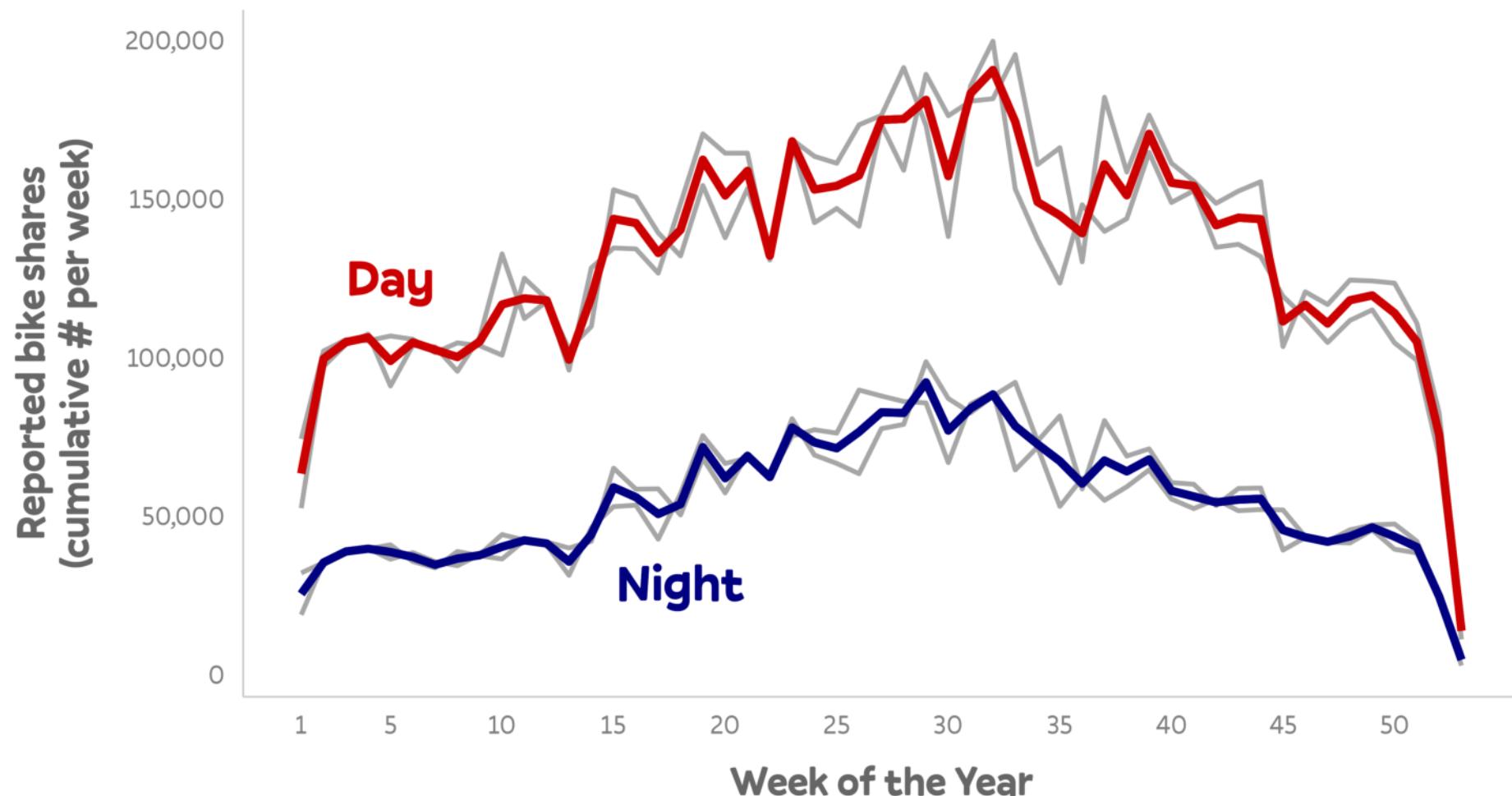
P1



P2



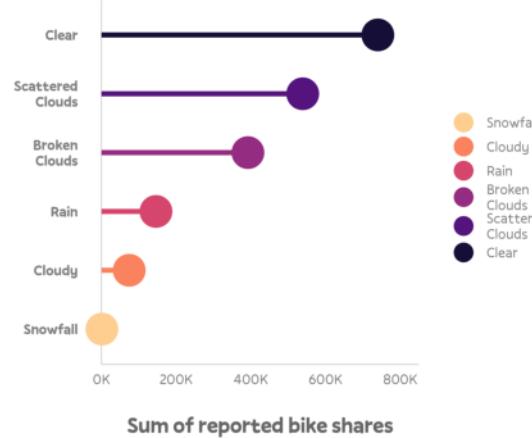
P3



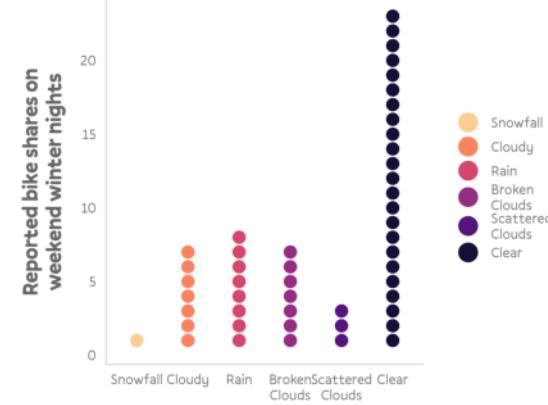
{patchwork}

```
1 # install.packages("patchwork")
2 library(patchwork)
3 (p1 + p2) / p3
```

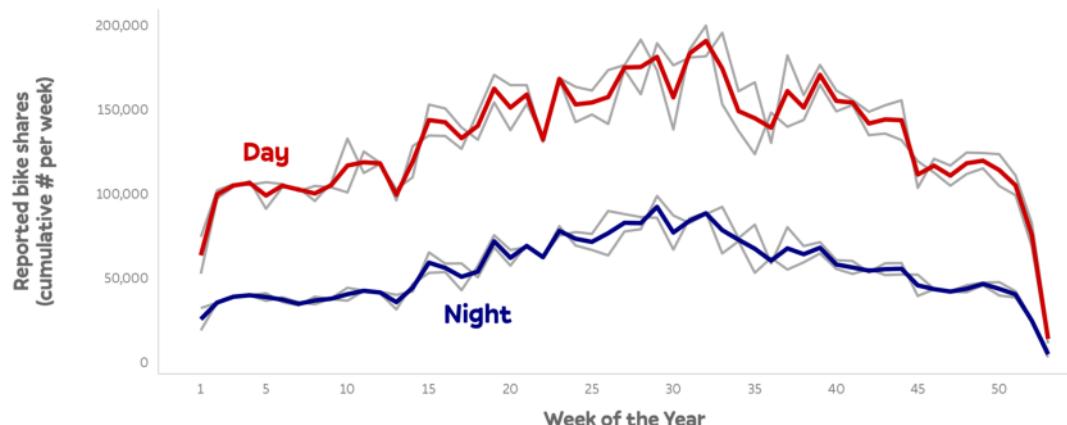
P1



P2



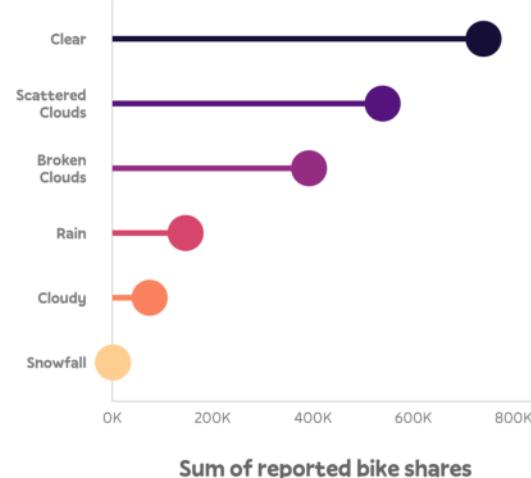
P3



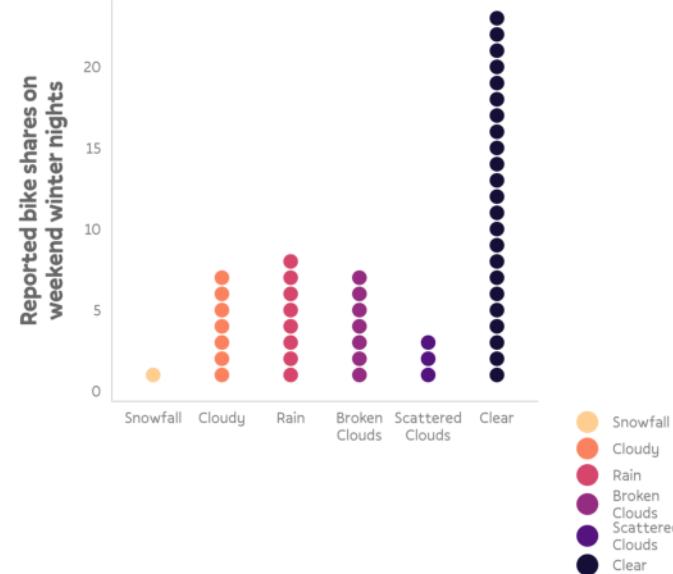
“Collect Guides”

```
1 (p1 + p2) / p3 + plot_layout(guides = "collect")
```

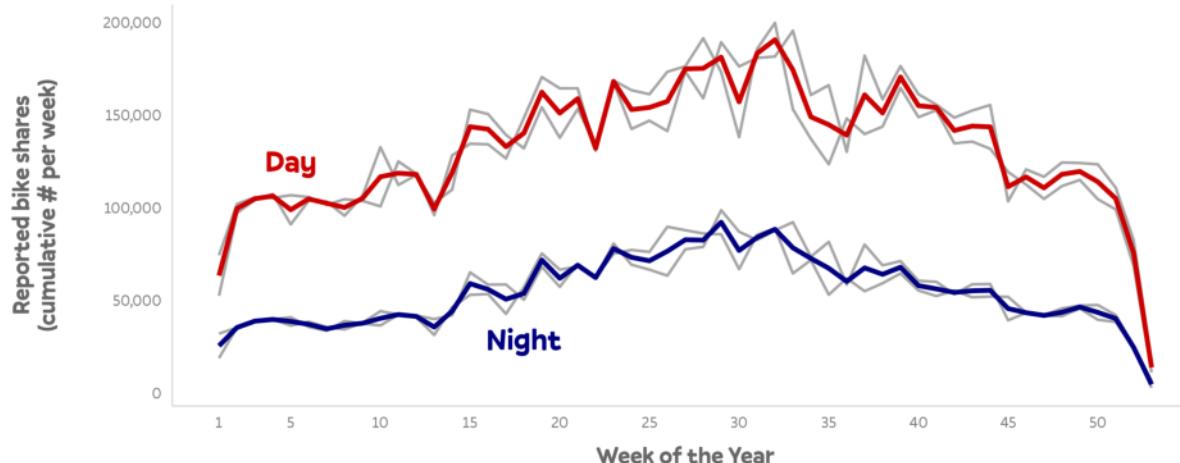
P1



P2



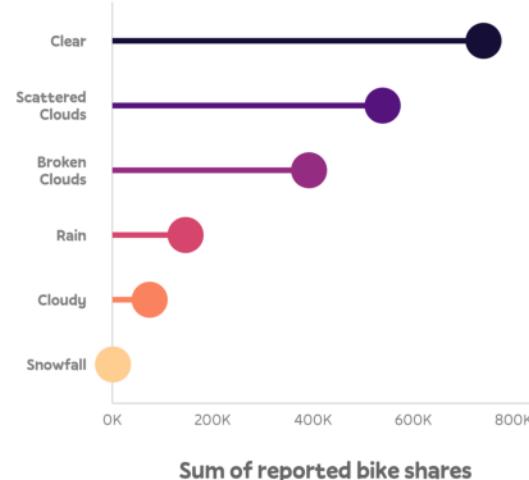
P3



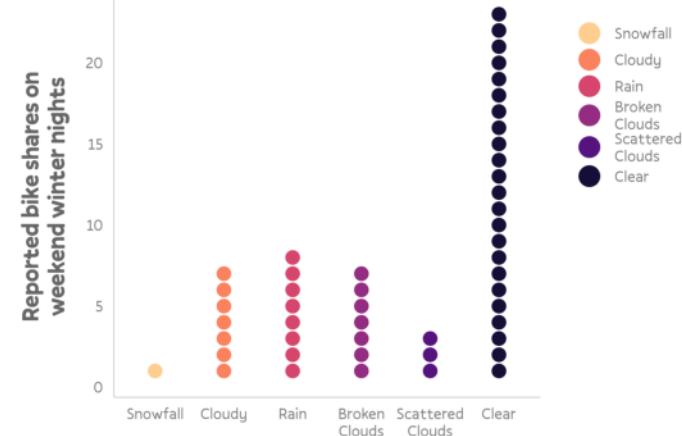
Apply Theming

```
1 ((p1 + p2) / p3 & theme(legend.justification = "top")) + plot_layout(guides = "collect")
```

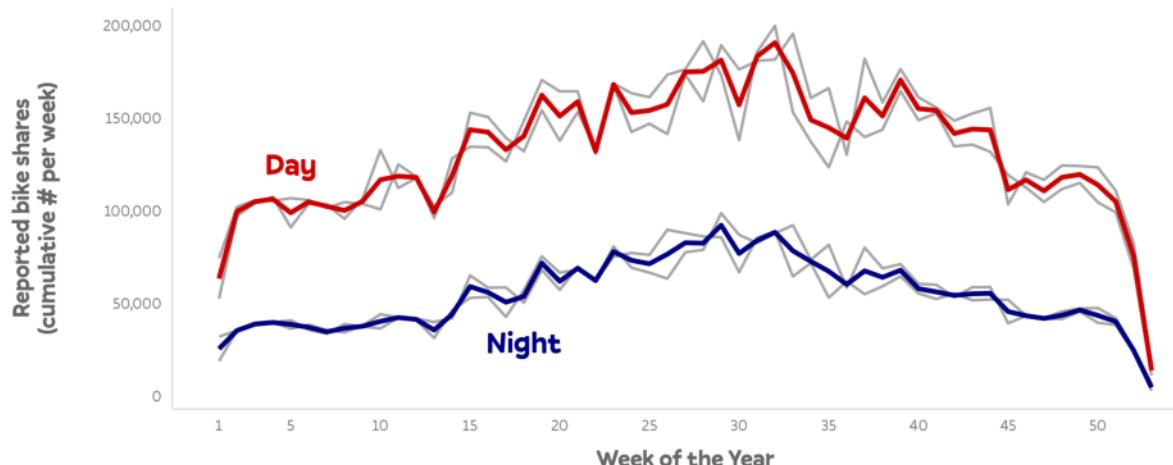
P1



P2

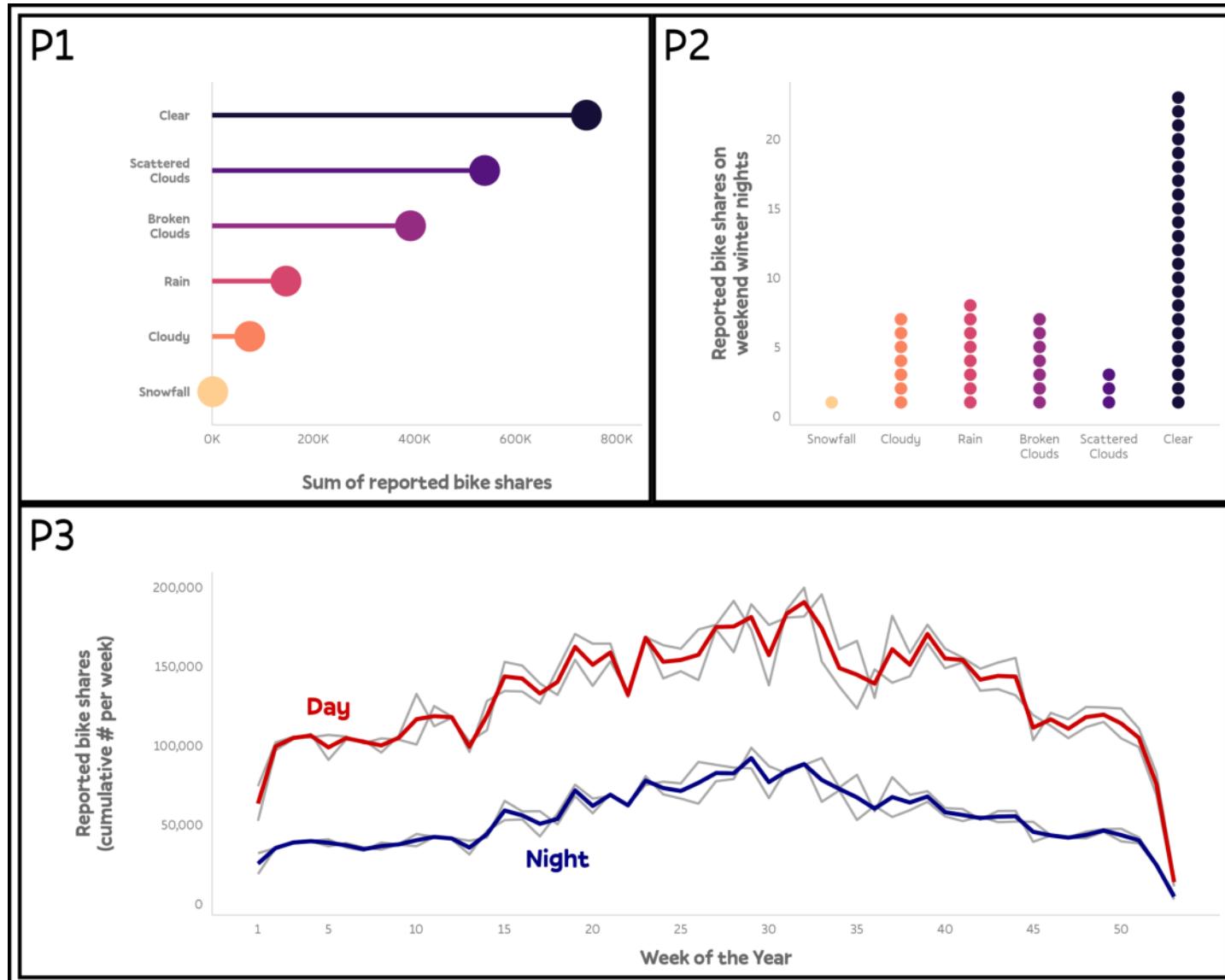


P3



Apply Theming

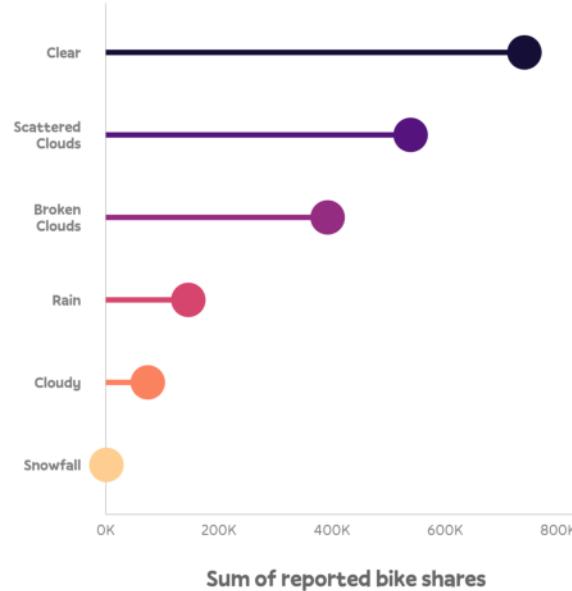
```
1 (p1 + p2) / p3 & theme(legend.position = "none", plot.background = element_rect(color = "black", siz
```



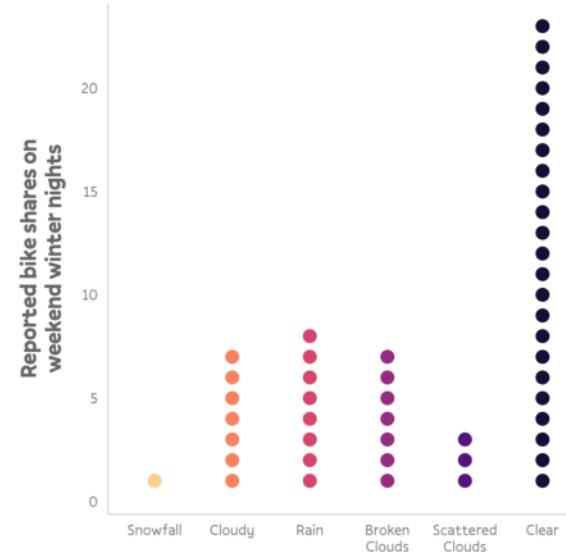
Adjust Widths and Heights

```
1 ((p1 + p2) / p3 & theme(legend.position = "none")) +  
2   plot_layout(heights = c(.2, .1), widths = c(2, 1))
```

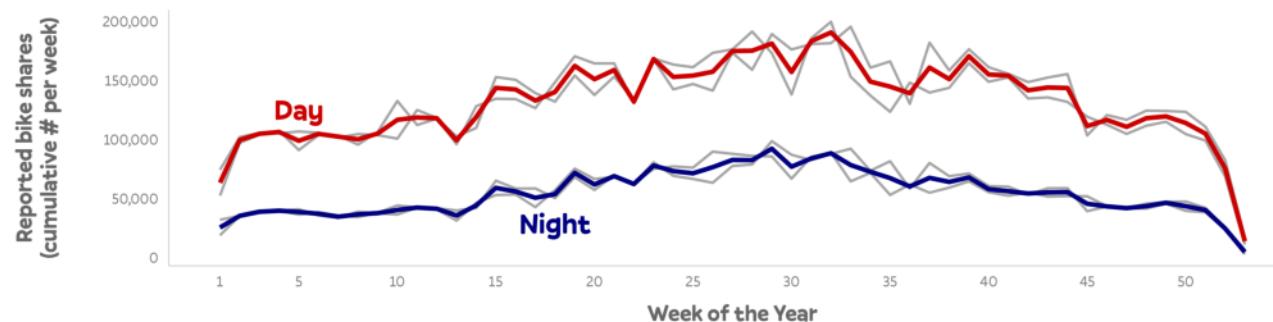
P1



P2



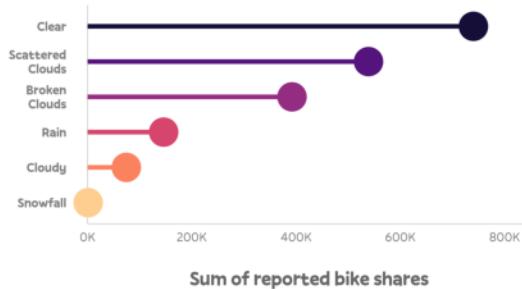
P3



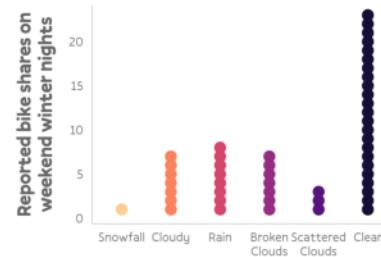
Use A Custom Layout

```
1 picasso <- "  
2 #####BBBB  
3 #####CCCC##  
4 #####CCCC##"  
5 (p1 + p2 + p3 & theme(legend.position = "none")) + plot_layout(design = picasso)
```

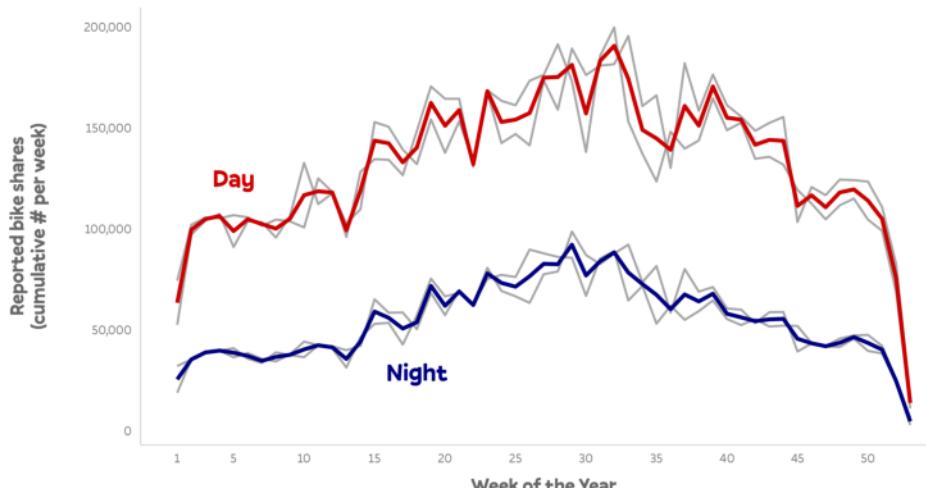
P1



P2



P3



Add Labels

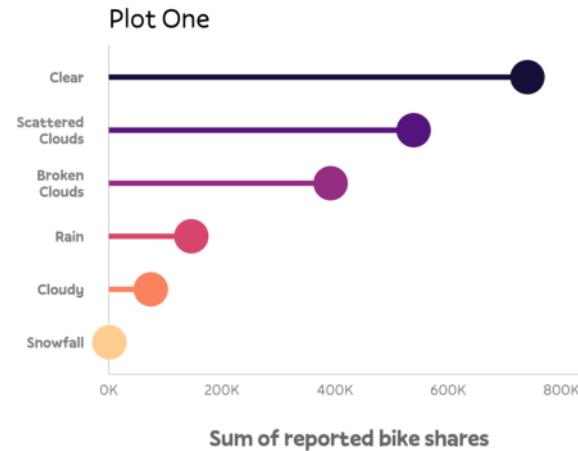
```
1 pl1 <- p1 + labs(tag = NULL, title = "Plot One") + theme(legend.position = "none")
2 pl2 <- p2 + labs(tag = NULL, title = "Plot Two") + theme(legend.position = "none")
3 pl3 <- p3 + labs(tag = NULL, title = "Plot Three") + theme(legend.position = "none")
```

Add Labels

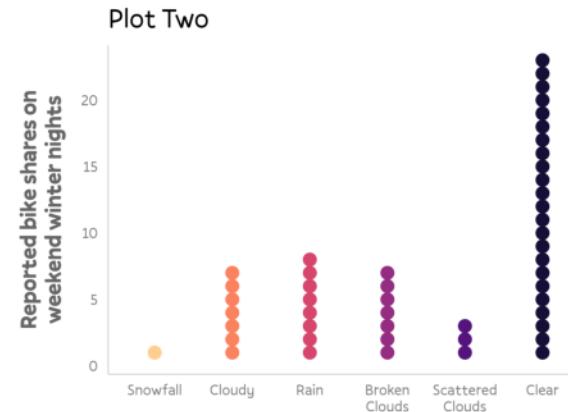
```
1 (p11 + p12) / p13 +  
2 plot_annotation(tag_levels = "1", tag_prefix = "P", title = "An overarching title for all 3 plots,
```

An overarching title for all 3 plots, placed on the very top while all other titles are sitting below the tags.

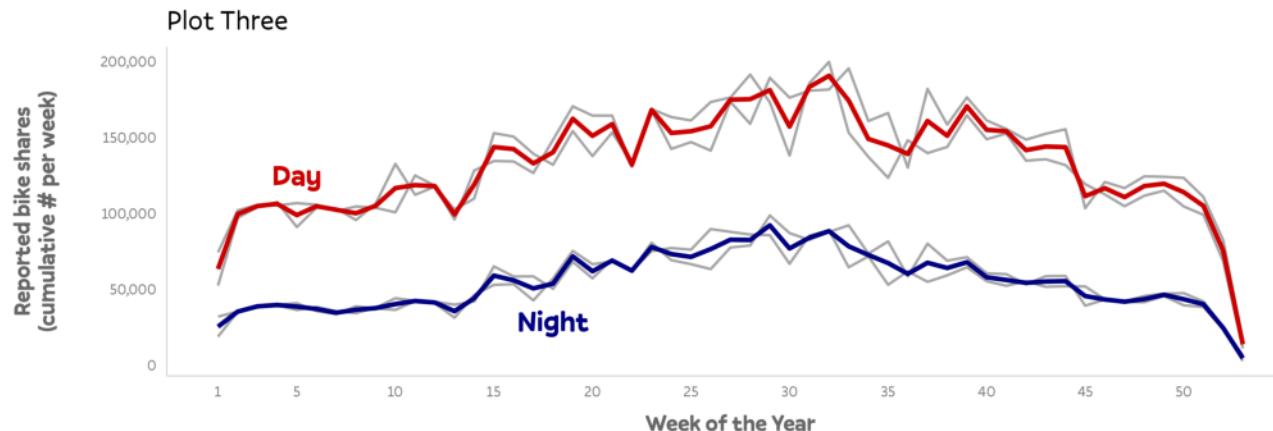
P1



P2



P3



Add Text

Graphic

Code

 Lorem ipsum dolor sit amet, **consectetur
adipiscing elit**, sed do eiusmod tempor
incididunt ut labore et dolore magna
aliqua. Ut enim ad minim veniam, quis
nostrud exercitation **ullamco laboris nisi**
ut aliquip ex ea commodo consequat.
Duis aute irure dolor in reprehenderit in
voluptate velit esse cillum dolore eu
fugiat nulla pariatur. Excepteur sint
occaecat **cupidatat non proident**, sunt
in culpa qui officia deserunt mollit anim id
est laborum.

Add Text

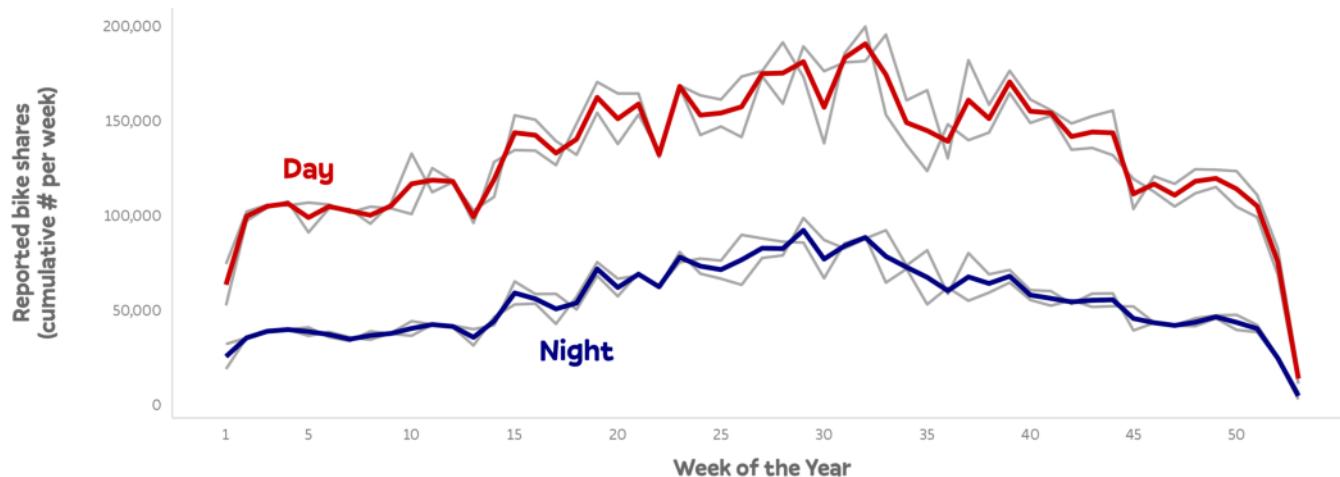
1 (p1 + pt) / p3

P1



Lorem ipsum dolor sit amet, **consectetur adipiscing elit**, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation **ullamco laboris nisi** ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat **cupidatat non proident**, sunt in culpa qui officia deserunt mollit anim id est laborum.

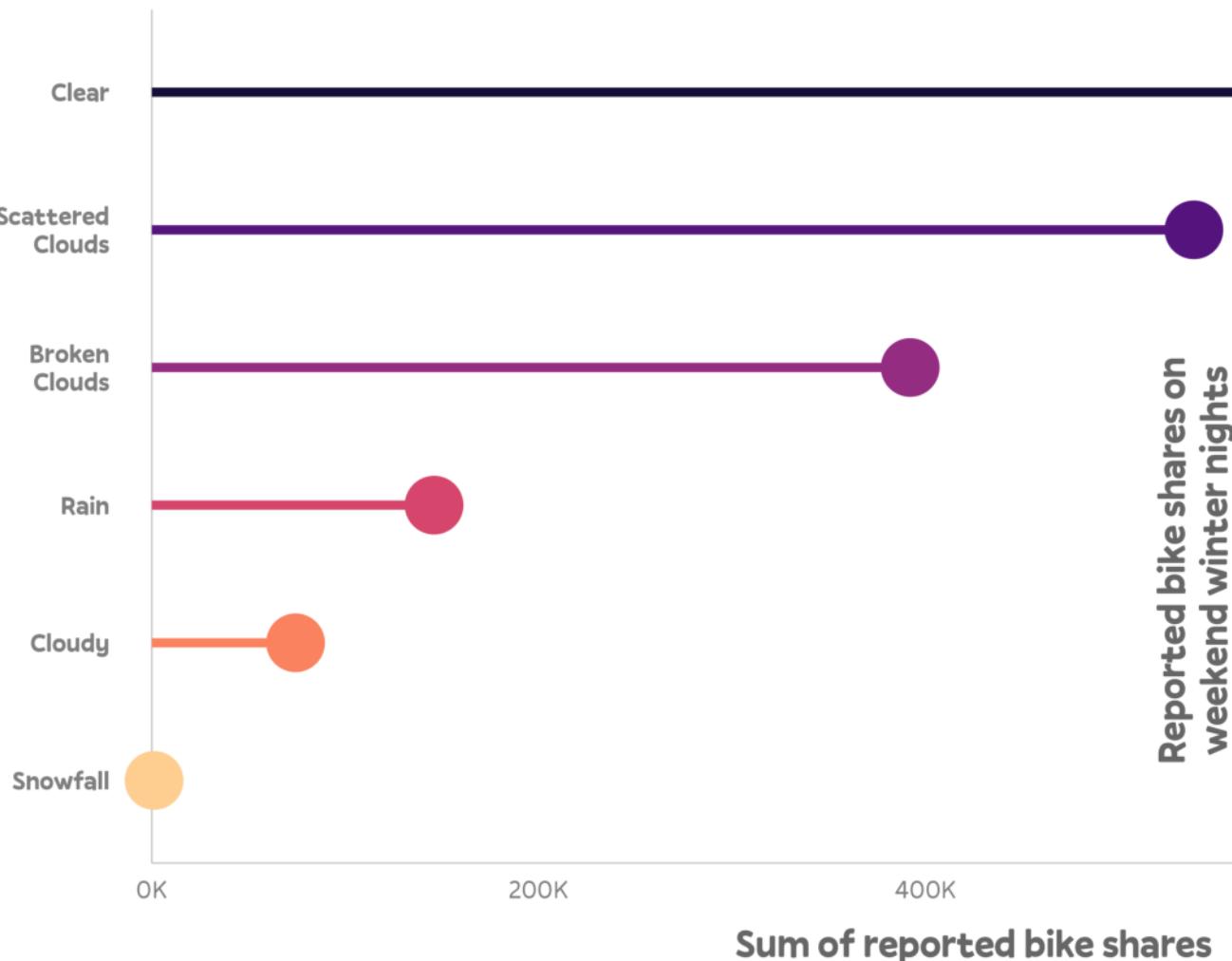
P3



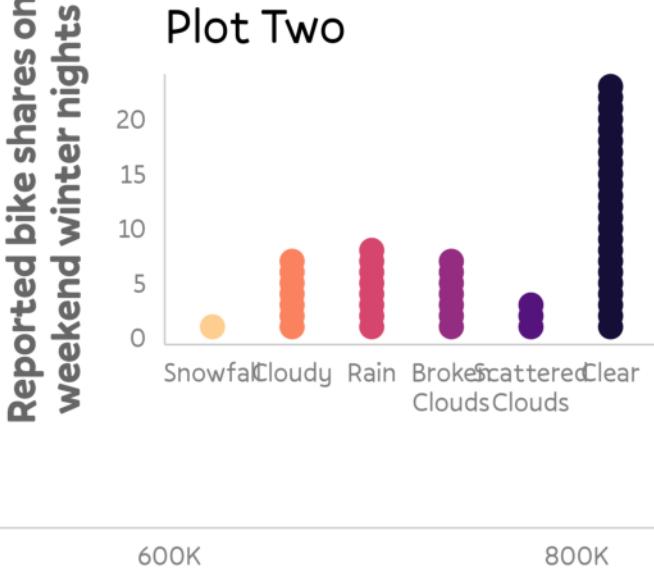
Add Inset Plots

```
1 pl1 + inset_element(pl2, l = .6, b = .1, r = 1, t = .6)
```

Plot One



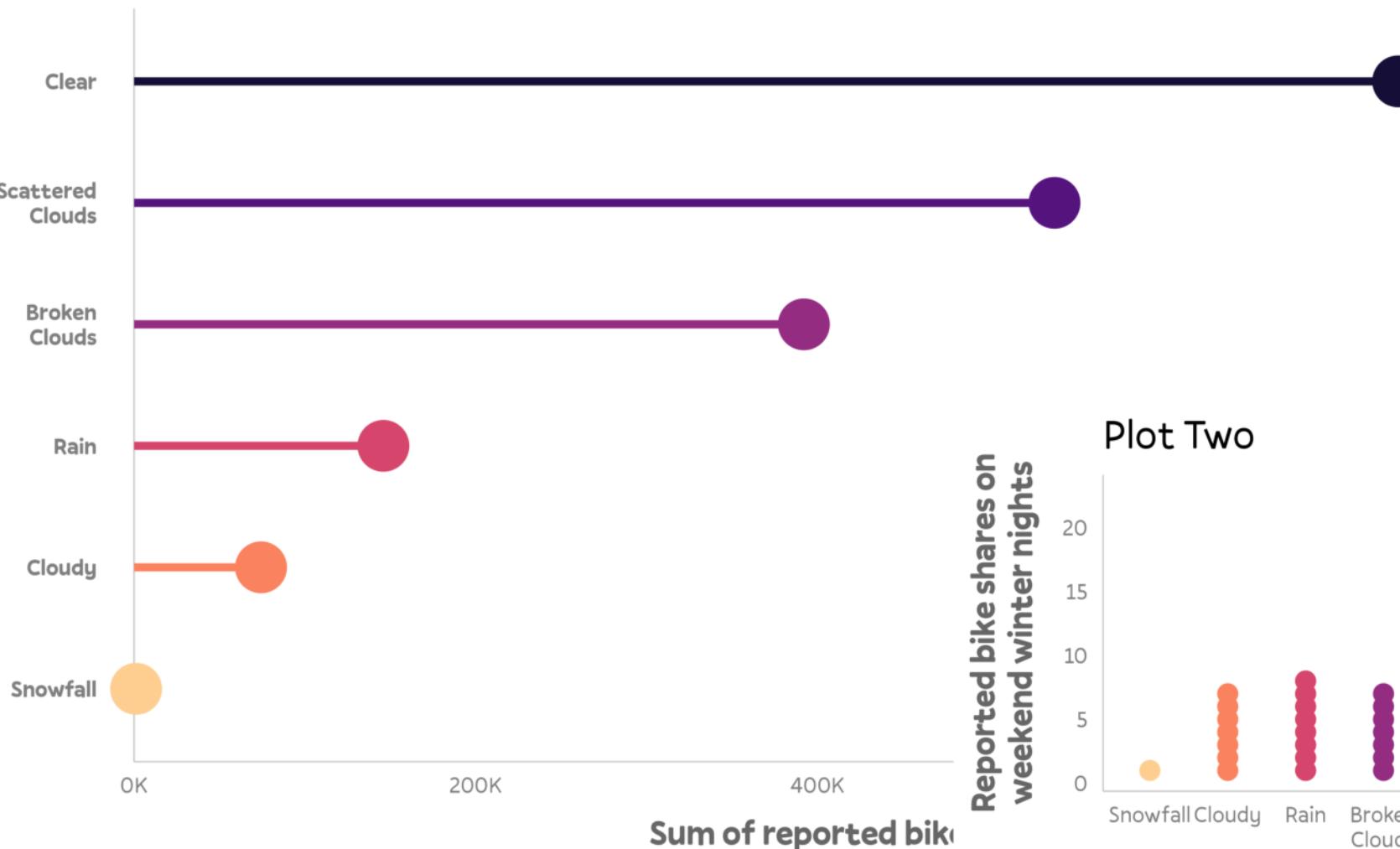
Plot Two



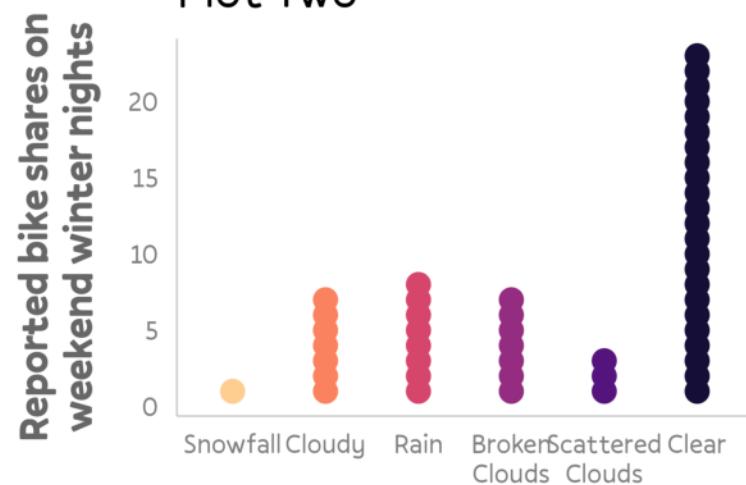
Add Inset Plots

```
1 pl1 + inset_element(pl2, l = .6, b = 0, r = 1, t = .5, align_to = 'full')
```

Plot One

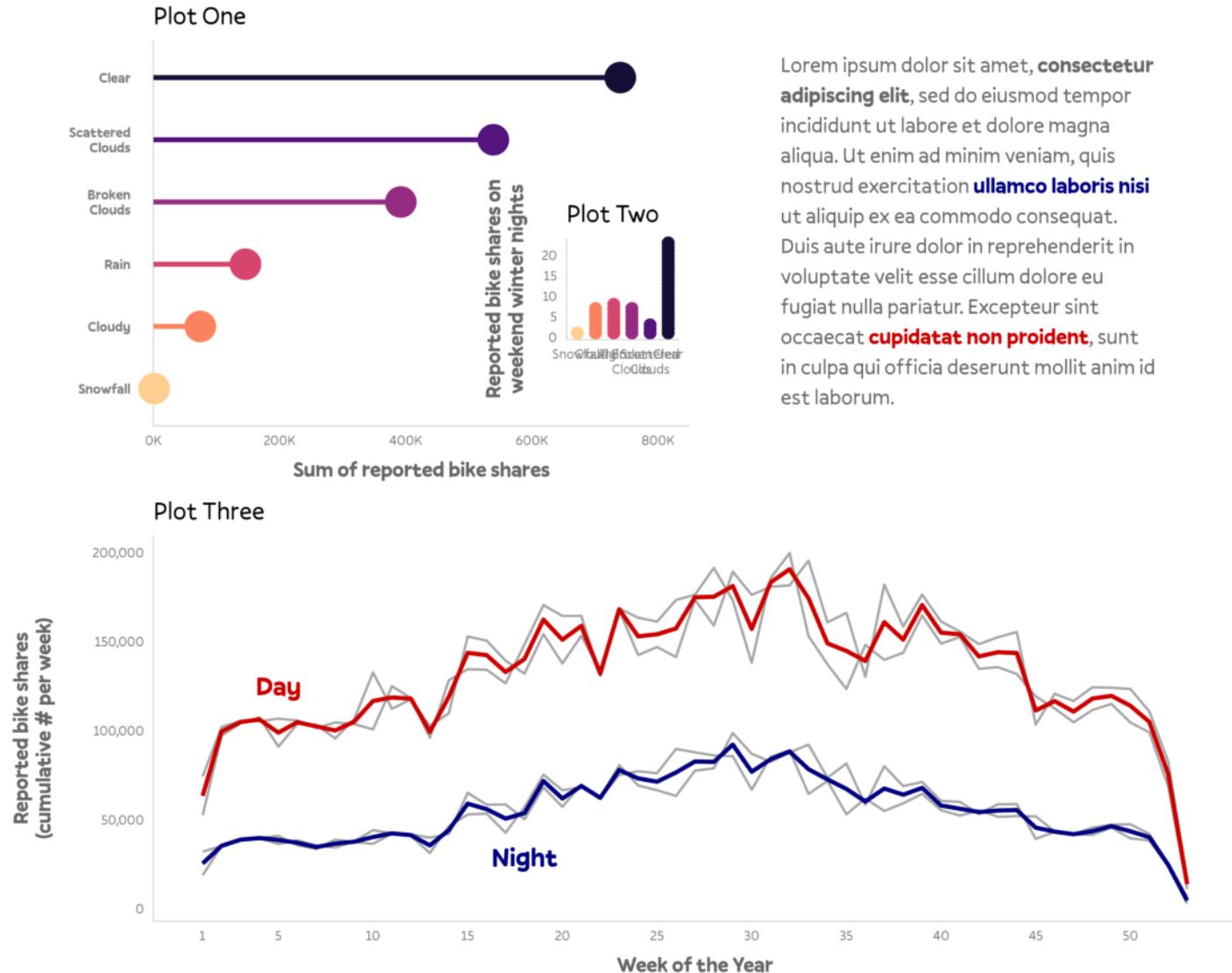


Plot Two



Add Inset Plots

```
1 (p11 + inset_element(p12, l = .6, b = .1, r = 1, t = .6) + pt) / p13
```



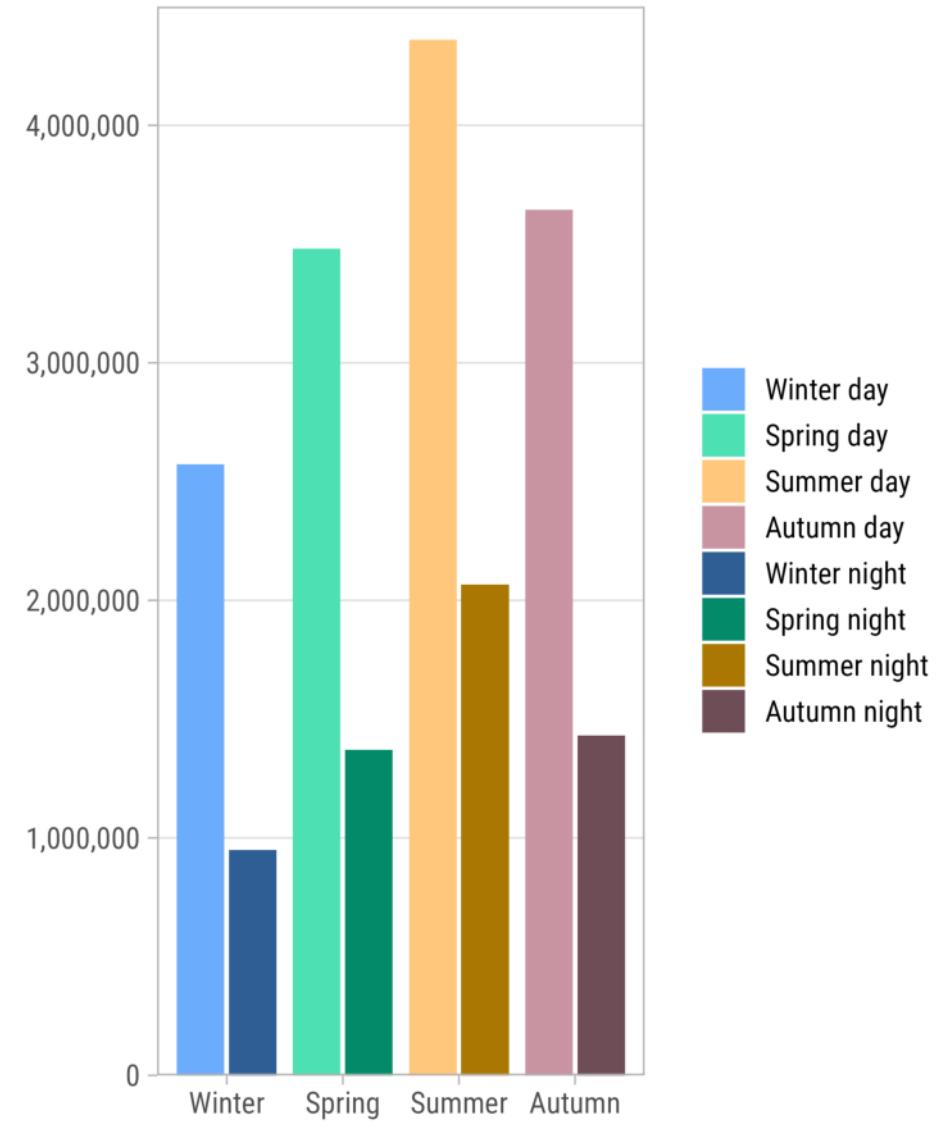
Recap

- **guides** are the combination of scales and legends
- legends can be either modified with the **guide_*** function in **scale_***() or **guides()** and with the **theme()** component qualitative
- ... while quantitative guides are **colorbar**, **colorsteps** or **bins**
- **{patchwork}** is the most modern and simplest way to compose plots
 - use **+**, **/** and **|** to combine plots
 - use **plot_layout()** to adjust the layout, widths and heights
 - use **plot_annotation()** to add tags and general labels
 - use **inset_element()** to add inset graphics

Appendix

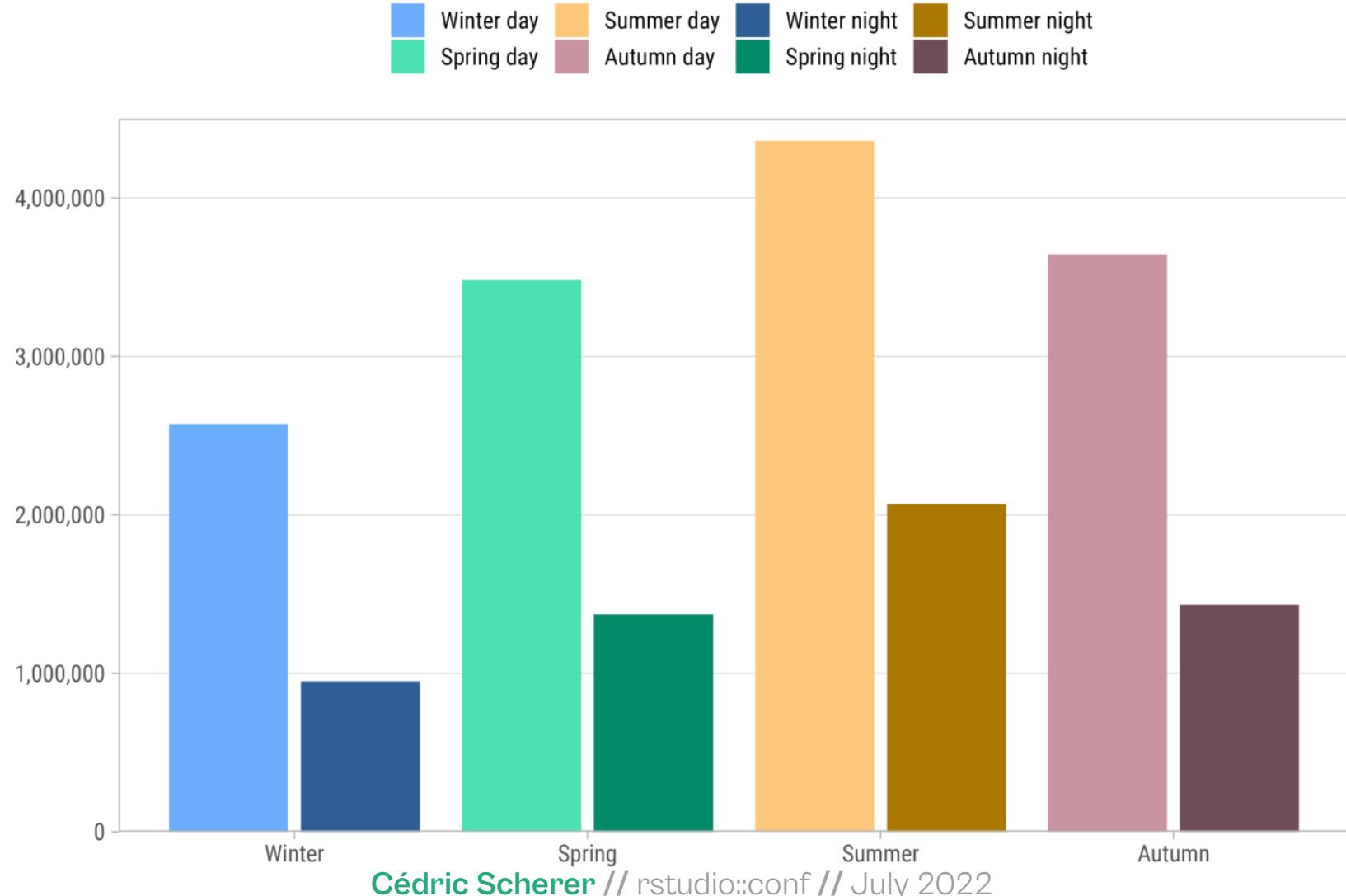
Legend with Color Shading

```
1 library(colorspace)
2 shades <- c(lighten(pal, .3),
3              darken(pal, .3))
4
5 g <-
6   bikes %>%
7   arrange(day_night, date) %>%
8   mutate(
9     season_day = paste(
10       str_to_title(season), day_night
11     ),
12     season_day = forcats::fct_inorder(season_day)
13   ) %>%
14   ggplot(
15     aes(x = season, y = count,
16         fill = season_day)
17   ) +
18   stat_summary(
19     geom = "col", fun = sum,
20     position = position_dodge2(
21       width = .2, padding = .1
22     )
23   ) +
```



Legend on Top

```
1 g +  
2 theme(legend.position = "top")
```



Resort Legend

```
1 g +
2 guides(fill = guide_legend(byrow = TRUE)) +
3 theme(legend.position = "top")
```

