cm008 Exercises: Fix the Plots

In this worksheet, we'll be looking at some erroneous plots and fixing them.

I think you might not have these two packages installed:

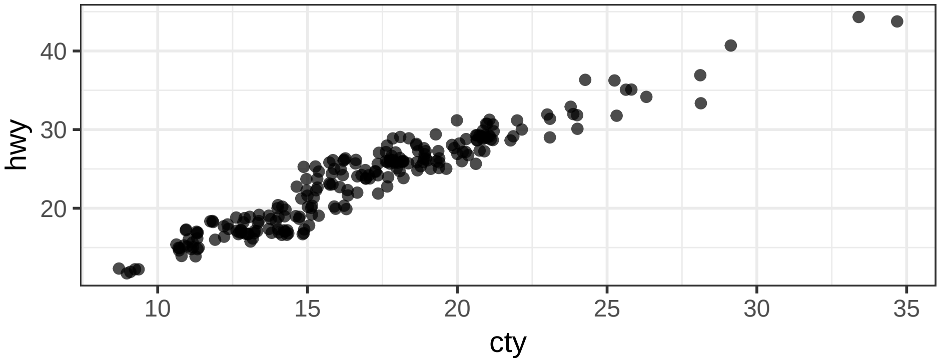
```
install.packages("ggridges")
install.packages("scales")
```

```
knitr::opts_chunk$set(error = TRUE, warning = FALSE)
gapminder
```

```
## # A tibble: 1,704 x 6
##    country     continent  year lifeExp      pop gdpPercap
##    <fct>       <fct>     <int>   <dbl>    <int>     <dbl>
##  1 Afghanistan Asia       1952    28.8  8425333      779.
##  2 Afghanistan Asia       1957    30.3  9240934      821.
##  3 Afghanistan Asia       1962    32.0 10267083      853.
##  4 Afghanistan Asia       1967    34.0 11537966      836.
##  5 Afghanistan Asia       1972    36.1 13079460      740.
##  6 Afghanistan Asia       1977    38.4 14880372      786.
##  7 Afghanistan Asia       1982    39.9 12881816      978.
##  8 Afghanistan Asia       1987    40.8 13867957      852.
##  9 Afghanistan Asia       1992    41.7 16317921      649.
## 10 Afghanistan Asia       1997    41.8 22227415      635.
## # ... with 1,694 more rows
```

Exercise 1: Overlapping Points

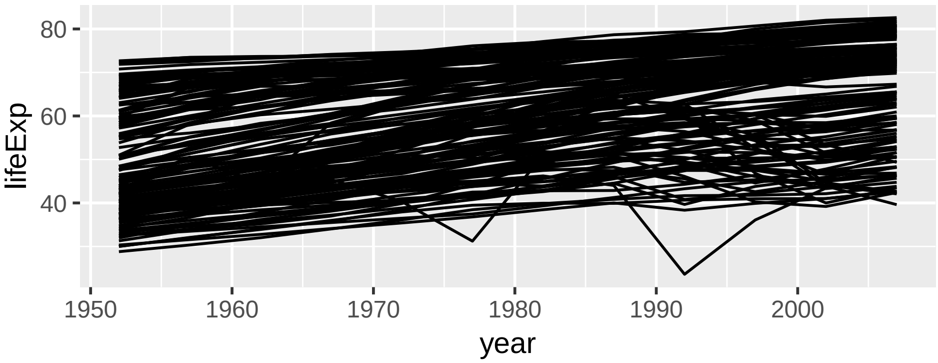
After fixing the error, fix the overlapping problem in the following plot (attribution: "R for data science").



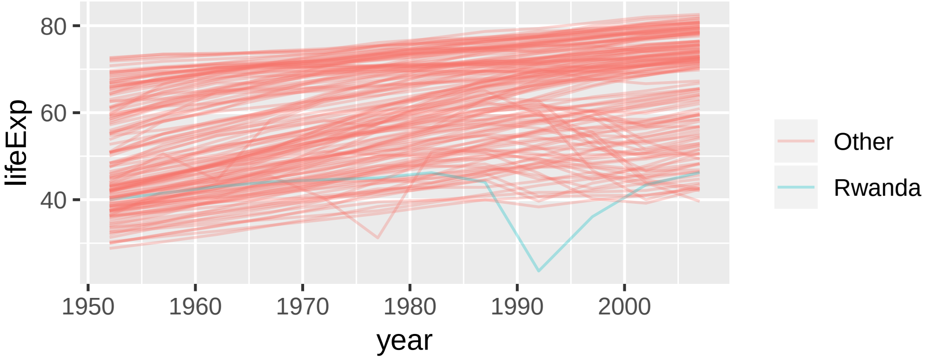
Exercise 2: Line for each Country

Fix this plot so that it shows life expectancy over time *for each country*. Notice that `ggplot2` ignores the grouping of a tibble!

```
ggplot(gapminder, aes(year, lifeExp, group = country)) +
  geom_line()
```



```
gapminder %>%
  # group_by(country) %>%
  ggplot(aes(year, lifeExp, group = country, colour = country == "Rwanda")) +
  geom_line(alpha = 0.3) +
  scale_colour_discrete("", labels = c("Other", "Rwanda"))
```

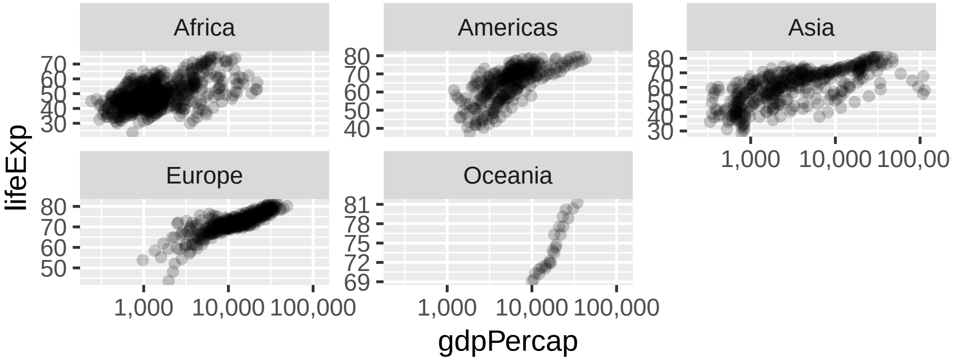


Exercise 3: More gdpPercap vs lifeExp

3(a) Facets

- Change the x-axis text to be in "comma format" with `scales::comma_format()`.
- Separate each continent into sub-panels.

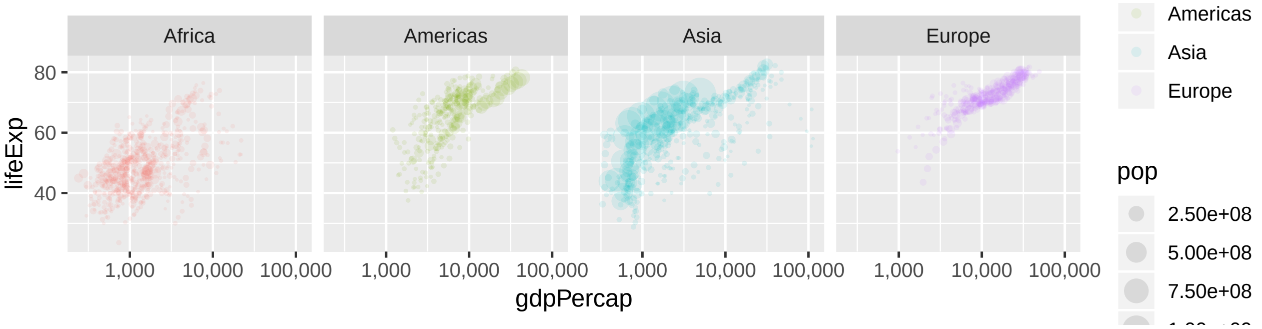
```
ggplot(gapminder, aes(gdpPercap, lifeExp)) +
  geom_point(alpha = 0.2) +
  scale_x_log10(labels = scales::comma_format()) +
  facet_wrap(~ continent, scales = "free_y")
```



3(b) Bubble Plot

- Put the plots in one row, and free up the axes.
- Make a bubble plot by making the size of the points proportional to population.
- Try adding a `scale_size_area()` layer too (could also try `scale_radius()`).
- Use `shape=21` to distinguish between `fill` (interior) and `colour` (exterior).

```r
gapminder %>%
  filter(continent != "Oceania") %>%
  ggplot(aes(gdpPercap, lifeExp, size = pop, colour = continent)) +
  facet_wrap(~ continent, nrow = 1) +
  geom_point(alpha = 0.1) +
  scale_x_log10(labels = scales::comma_format()) +
  scale_size_area()
```

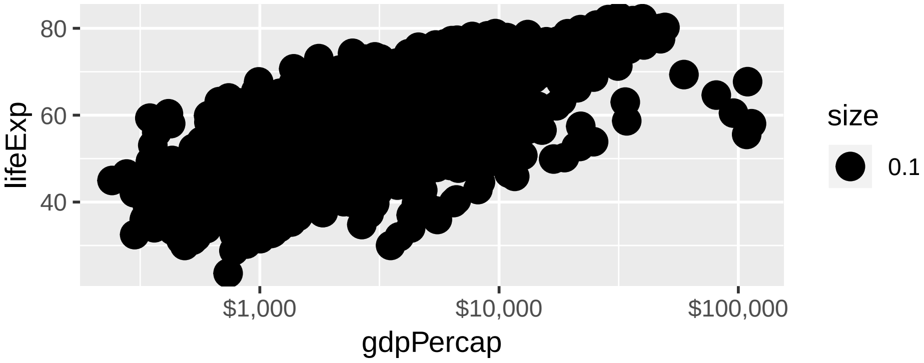


A list of shapes can be found at the bottom of the `scale_shape` documentation.

3(c) Size "not working"

Instead of alpha transparency, suppose you're wanting to fix the overplotting issue by plotting small points. Why is this not working? Fix it.

```r
ggplot(gapminder) +
  geom_point(aes(gdpPercap, lifeExp, size = 0.1)) +
  scale_x_log10(labels = scales::dollar_format())
```



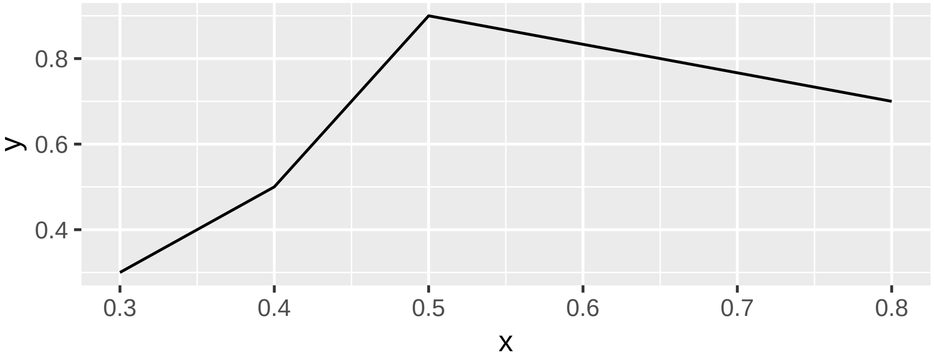
Exercise 4: Walking caribou

The following mock data set marks the (x,y) position of a caribou at four time points.

- Fix the plot below so that it shows the path of the caribou.

- Add an arrow with `arrow = arrow()`.
- Add the `time` label with `geom_text()`.

```
tribble(
  ~time, ~x, ~y,
  1, 0.3, 0.3,
  2, 0.8, 0.7,
  3, 0.5, 0.9,
  4, 0.4, 0.5
) %>%
  ggplot(aes(x, y)) +
  geom_line()
```

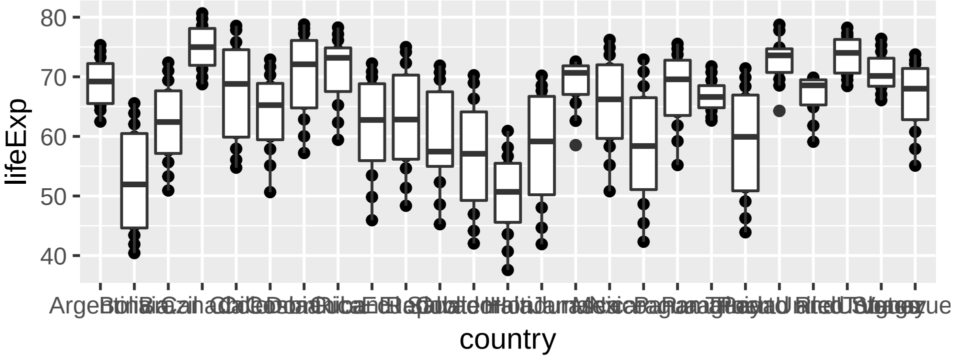


Exercise 5: Life expectancies in Africa

5(a) Unhiding the data

Fix the plot so that you can actually see the data points. Be sure to solve the problem of overlapping text, without rotating the text.

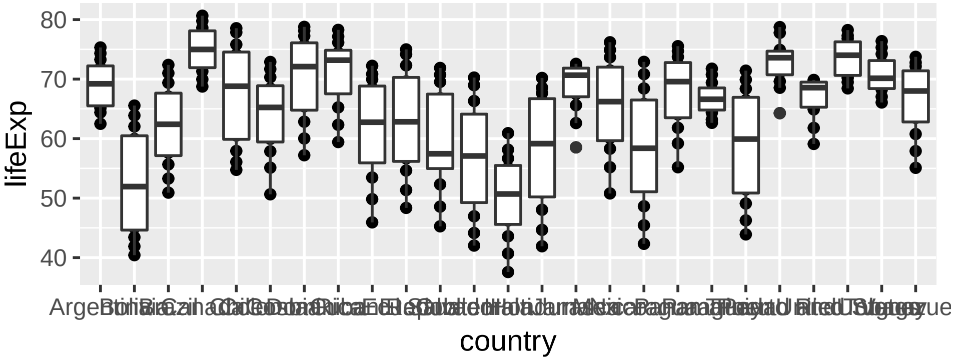
```
gapminder %>%
  filter(continent == "Americas") %>%
  ggplot(aes(country, lifeExp)) +
  geom_point() +
  geom_boxplot()
```



5(b) Ridgeplots

We're starting with the same plot as above, but instead of the points + boxplot, try a ridge plot instead using `ggridges::geom_density_ridges()`, and adjust the `bandwidth`.

```
gapminder %>%
  filter(continent == "Americas") %>%
  ggplot(aes(country, lifeExp)) +
  geom_point() +
  geom_boxplot()
```

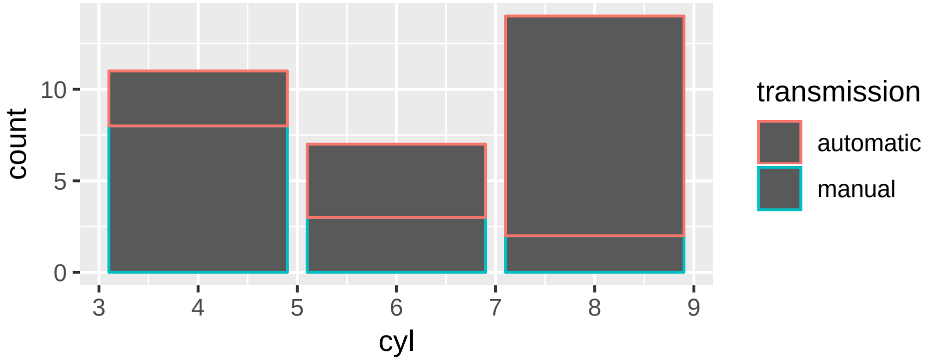


Exercise 6: Bar plot madness

6(a) Colour and stacking madness

- Change the following plot so that it shows *proportion* on the y-axis, not count.
- Change the x-axis so that it doesn't appear to be continuous.
- Put the bars for transmission side-by-side with their own colour.
- Capitalize the legend title.

```
mtcars %>%
  mutate(transmission = if_else(am == 0, "automatic", "manual")) %>%
  ggplot(aes(cyl)) +
  geom_bar(aes(colour = transmission))
```



6(b) Bar heights already calculated

Here's the number of people having a certain hair colour from a sample of 592 people:

```
(hair <- as_tibble(HairEyeColor) %>%
  count(Hair, wt = n))
```

```
## # A tibble: 4 x 2
##   Hair      n
##   <chr> <dbl>
## 1 Black   108
## 2 Blond   127
## 3 Brown   286
## 4 Red      71
```

Fix the following bar plot so that it shows these counts.

```
ggplot(hair, aes(Hair, n)) +
  geom_bar()
```

```
## Error: stat_count() must not be used with a y aesthetic.
```

Exercise 7: Tiling

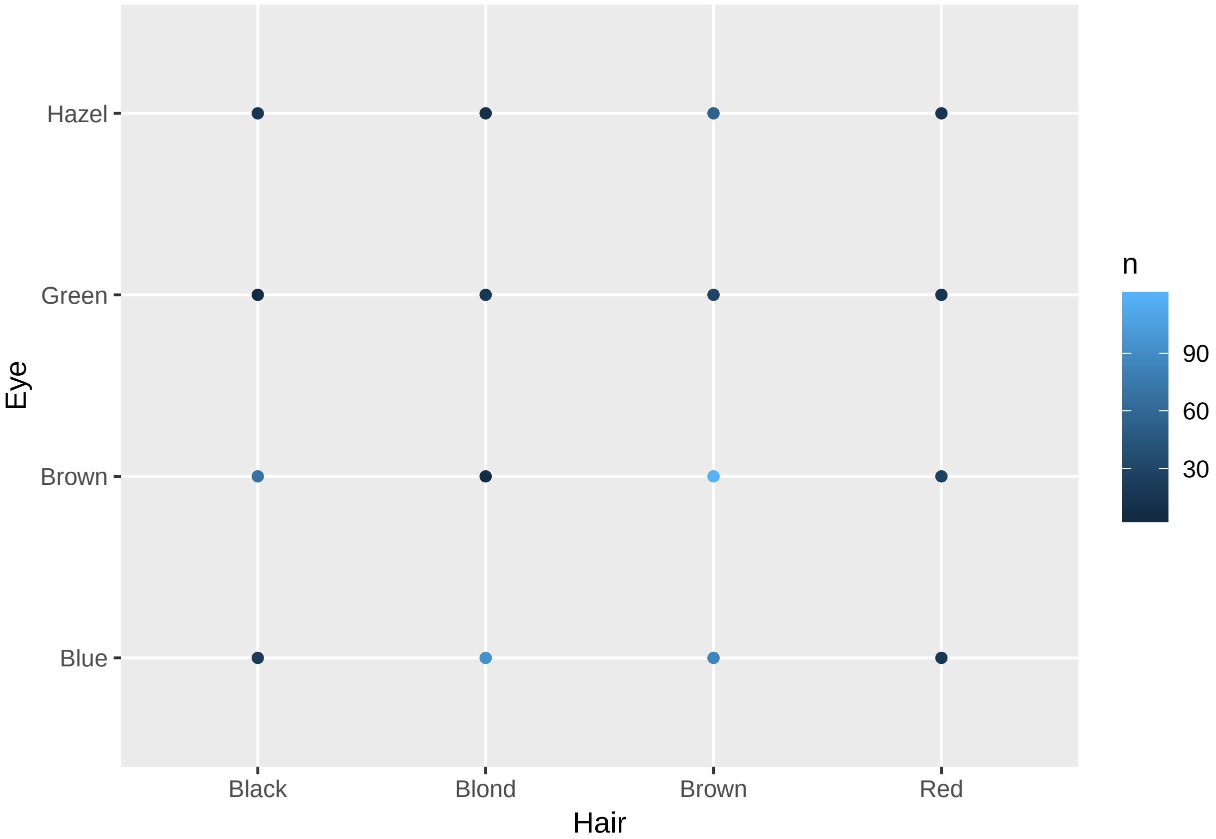
Here's the number of people having a certain hair and eye colour from a sample of 592 people:

```
(hair_eye <- as_tibble(HairEyeColor) %>%
  count(Hair, Eye, wt = n))
```

```
## # A tibble: 16 x 3
##    Hair  Eye       n
##    <chr> <chr> <dbl>
##  1 Black Blue     20
##  2 Black Brown    68
##  3 Black Green     5
##  4 Black Hazel    15
##   5 Blond Blue     94
##   6 Blond Brown     7
##   7 Blond Green    16
##   8 Blond Hazel    10
##   9 Brown Blue     84
##  10 Brown Brown   119
##  11 Brown Green    29
##  12 Brown Hazel    54
##  13 Red   Blue     17
##  14 Red   Brown    26
##  15 Red   Green    14
##  16 Red   Hazel    14
```

Fix the following plot so that it shows a filled-in square for each combination.

```
ggplot(hair_eye, aes(Hair, Eye)) +
  geom_point(aes(colour = n))
```



By the way, `geom_count()` is like `geom_bar()`: it counts the number of overlapping points.

Additional take-home practice

If you'd like some practice, give these exercises a try

Exercise 1: Make a plot of `year` (x) vs `lifeExp` (y), with points coloured by continent. Then, to that same plot, fit a straight regression line to each continent, without the error bars. If you can, try piping the data frame into the `ggplot()` function.

Exercise 2: Repeat Exercise 1, but switch the *regression line* and *geom_point* layers. How is this plot different from that of Exercise 1?

Exercise 3: Omit the `geom_point()` layer from either of the above two plots (it doesn't matter which). Does the line still show up, even though the data aren't shown? Why or why not?

Exercise 4: Make a plot of `year` (x) vs `lifeExp` (y), facetted by continent. Then, fit a smoother through the data for each continent, without the error bars. Choose a span that you feel is appropriate.

Exercise 5: Plot the population over time (year) using lines, so that each country has its own line. Colour by `gdpPercap`. Add alpha transparency to your liking.

Exercise 6: Add points to the plot in Exercise 5.