Challenge-7

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Data: Palmer Penguins

Measurements for penguin species, island in Palmer Archipelago, size (flipper length, body mass, bill dimensions), and gender.

```
library(tidyverse) #load tidyverse
```

```
## Warning: package 'tidyverse' was built under R version 4.2.3
```

```
## Warning: package 'ggplot2' was built under R version 4.2.3
```

```
## Warning: package 'tibble' was built under R version 4.2.3
```

```
## Warning: package 'tidyr' was built under R version 4.2.3
```

```
## Warning: package 'readr' was built under R version 4.2.3
```

```
## Warning: package 'purrr' was built under R version 4.2.3
```

```
## Warning: package 'dplyr' was built under R version 4.2.3
```

```
## Warning: package 'stringr' was built under R version 4.2.3
```

```
## Warning: package 'forcats' was built under R version 4.2.3
```

```
## Warning: package 'lubridate' was built under R version 4.2.3
```

```
## -- Attaching core tidyverse packages ------------------------ tidyverse 2.0.0 --
## v dplyr     1.1.1     v readr     2.1.4
## v forcats   1.0.0     v stringr   1.5.0
## v ggplot2   3.4.3     v tibble    3.2.1
## v lubridate 1.9.2     v tidyr     1.3.0
## v purrr     1.0.2
## -- Conflicts ------------------------------------------ tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
## i Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to become error
```

```
library(palmerpenguins) #load data
```

```
## Warning: package 'palmerpenguins' was built under R version 4.2.3
```

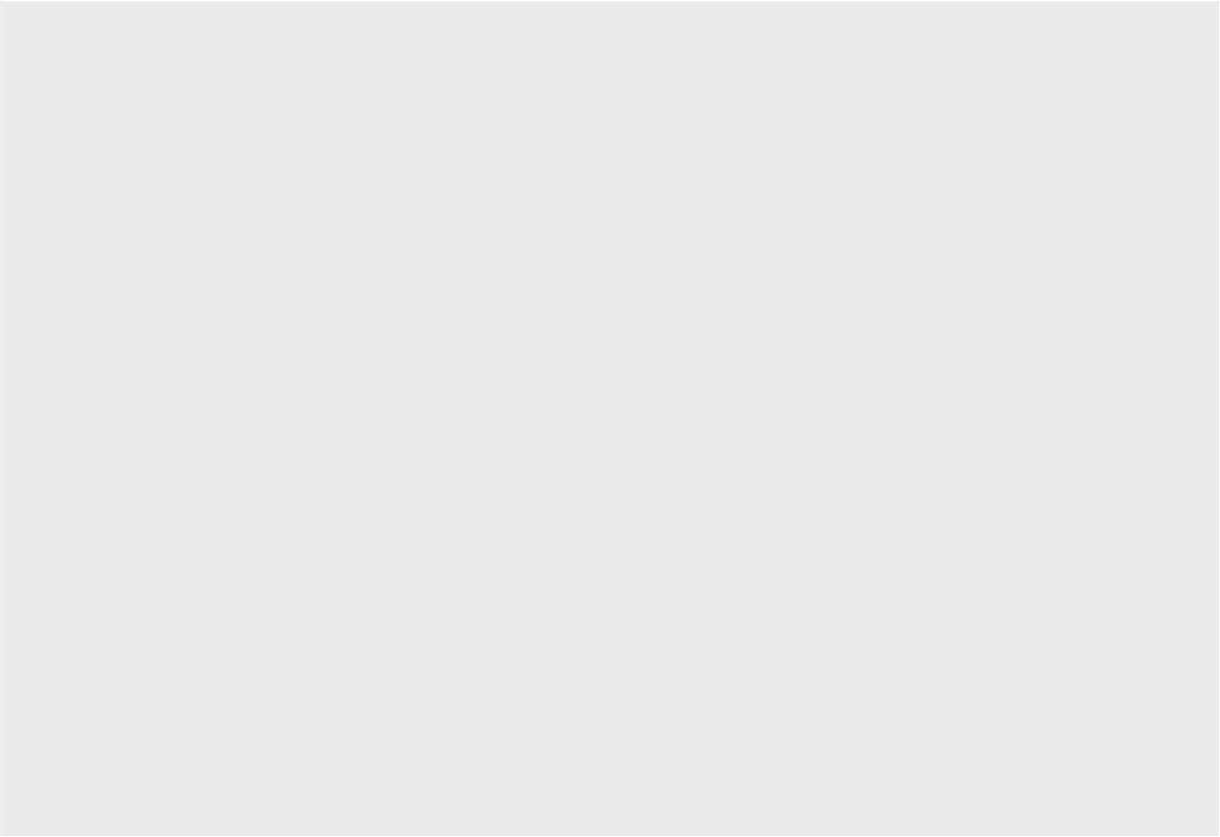
```
glimpse(penguins) #show columns of data stacked on top of one another
```

```
## Rows: 344
## Columns: 8
## $ species           <fct> Adelie, Adelie, Adelie, Adelie, Adelie, Adelie, Adel~
## $ island            <fct> Torgersen, Torgersen, Torgersen, Torgersen, Torgerse~
## $ bill_length_mm    <dbl> 39.1, 39.5, 40.3, NA, 36.7, 39.3, 38.9, 39.2, 34.1, ~
## $ bill_depth_mm     <dbl> 18.7, 17.4, 18.0, NA, 19.3, 20.6, 17.8, 19.6, 18.1, ~
## $ flipper_length_mm <int> 181, 186, 195, NA, 193, 190, 181, 195, 193, 190, 186~
## $ body_mass_g       <int> 3750, 3800, 3250, NA, 3450, 3650, 3625, 4675, 3475, ~
## $ sex               <fct> male, female, female, NA, female, male, female, male~
## $ year              <int> 2007, 2007, 2007, 2007, 2007, 2007, 2007, 2007, 2007~
```

Palmer Penguins: Plot recreation

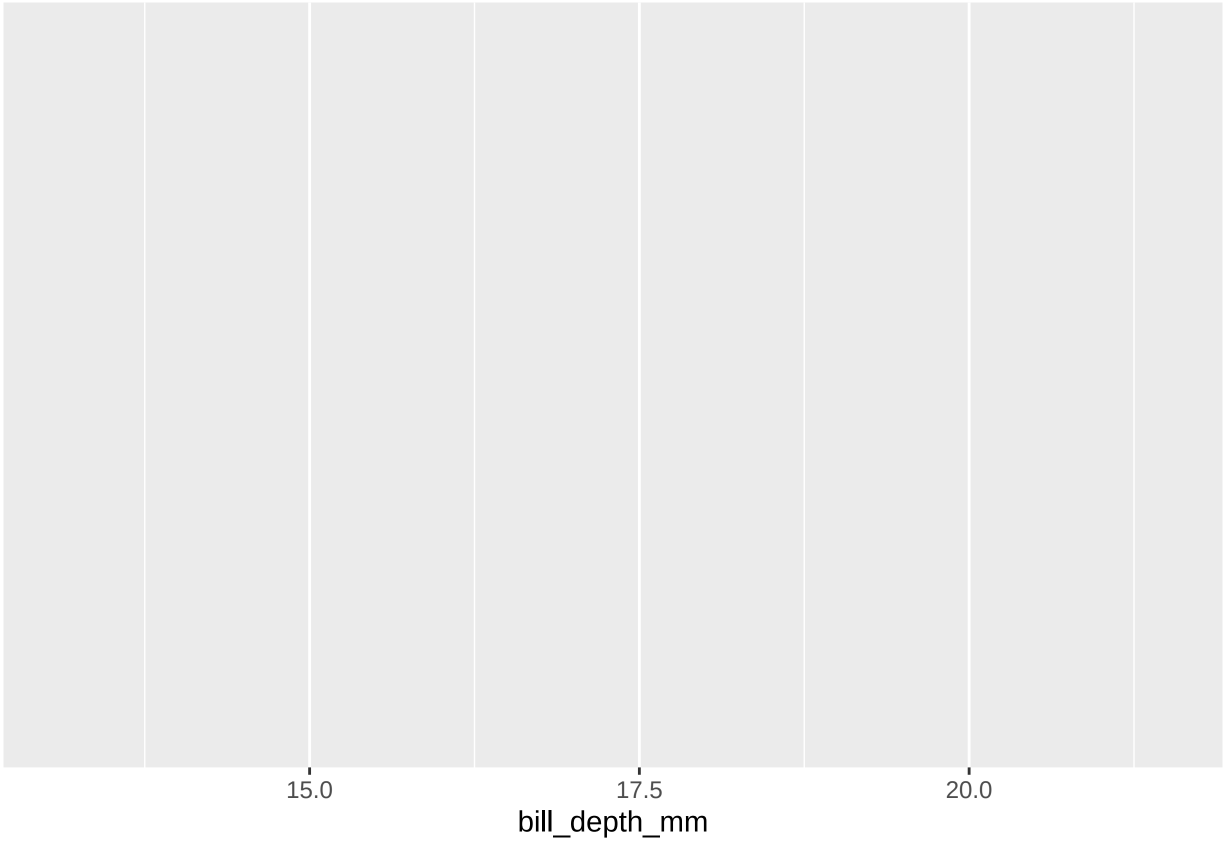
a. Start with the penguins data frame

```
ggplot(data = penguins) #plot data
```



b. Map bill depth to the x-axis

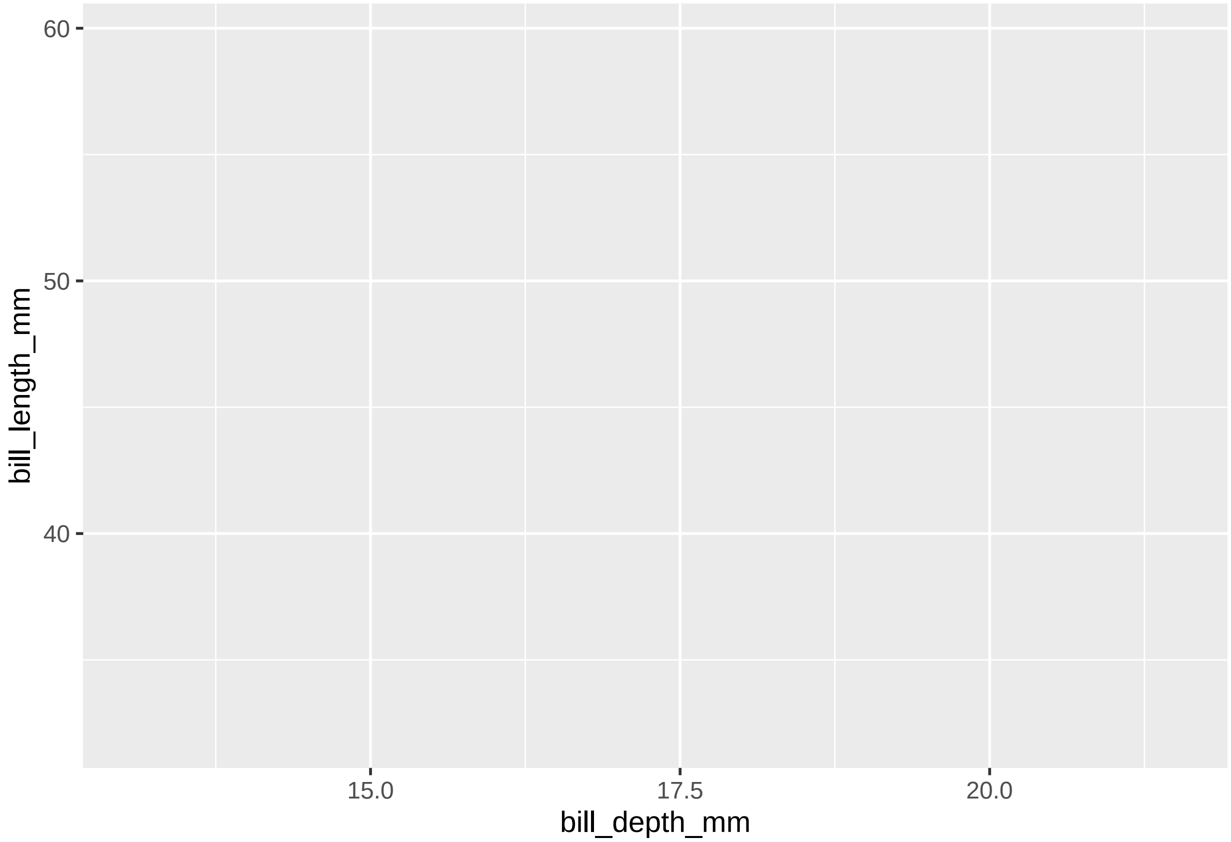
```
ggplot(data = penguins,
mapping = aes(x = bill_depth_mm))
```



```
#plot data with x axis as bill depth
```

c. Map bill depth to the y-axis

```
ggplot(data = penguins,
mapping = aes(x = bill_depth_mm,
y = bill_length_mm))
```

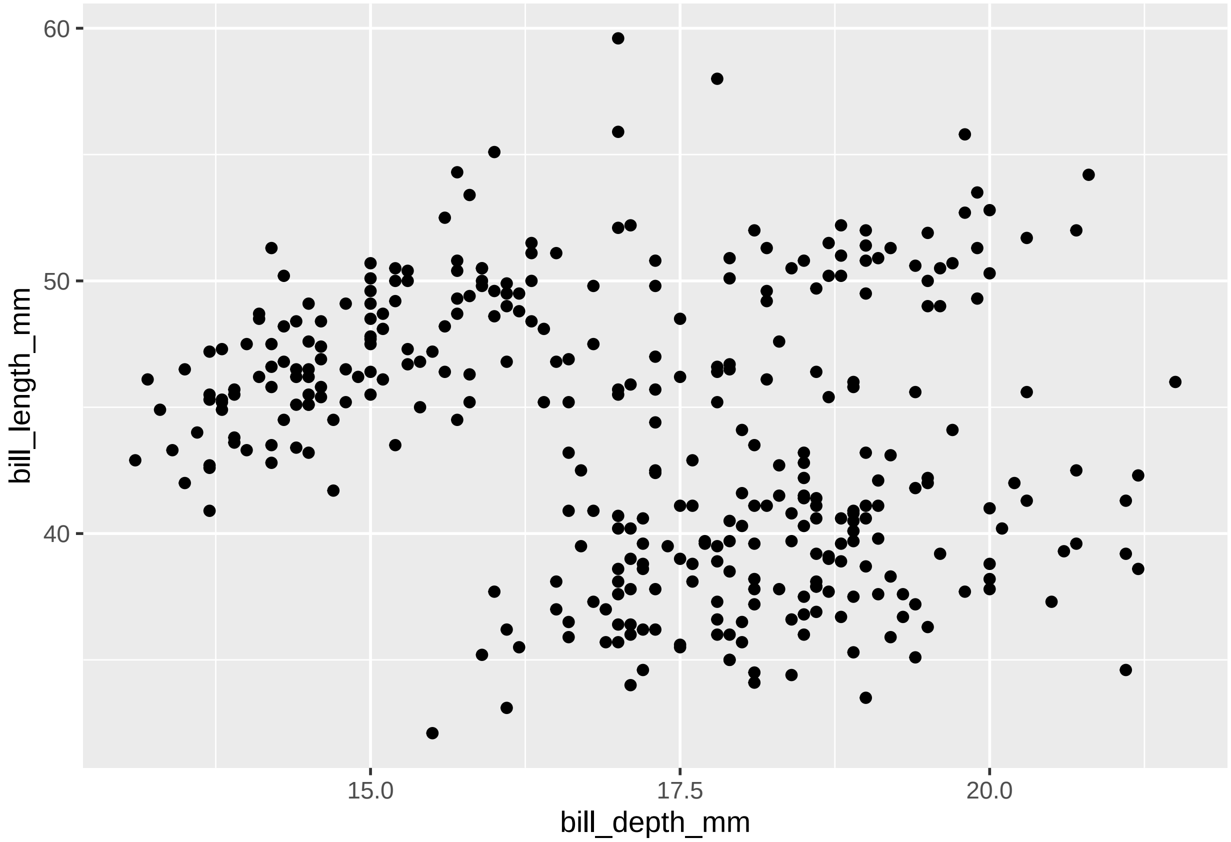


```r
#plot data with x axis as bill depth and y axis is bill length
```

d. Represent each observation with a point

```r
ggplot(data = penguins,
mapping = aes(x = bill_depth_mm,
y = bill_length_mm)) +
geom_point()
```

```
## Warning: Removed 2 rows containing missing values (‘geom_point()‘).
```

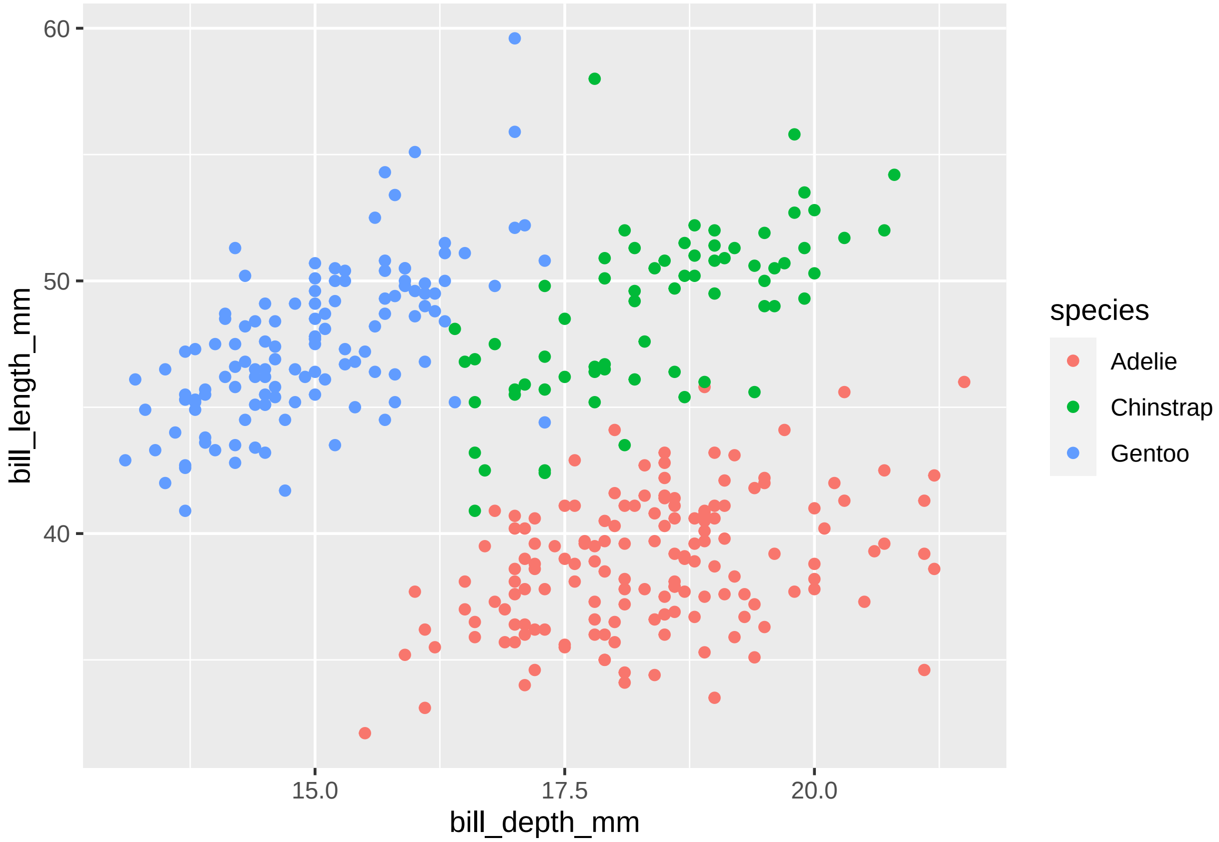


```
#plot points
```

e. Map species to the colour of each point

```
ggplot(data = penguins,
mapping = aes(x = bill_depth_mm,
y = bill_length_mm,
colour = species)) +
geom_point()
```

```
## Warning: Removed 2 rows containing missing values (‘geom_point()‘).
```

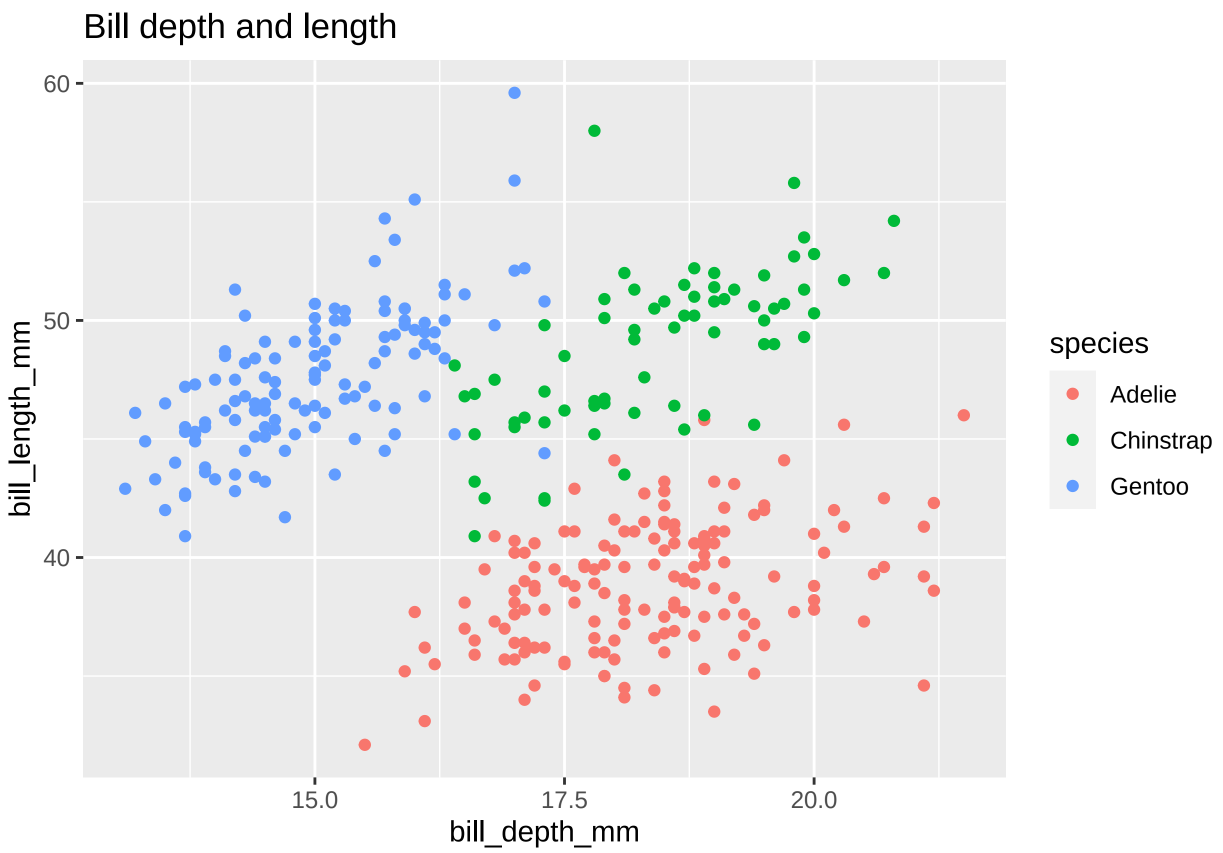


```r
#colour the point according to species
```

f. Title the plot “Bill depth and length”

```r
ggplot(data = penguins,
mapping = aes(x = bill_depth_mm,
y = bill_length_mm,
colour = species)) +
geom_point() +
labs(title = "Bill depth and length")
```

```
## Warning: Removed 2 rows containing missing values (‘geom_point()‘).
```

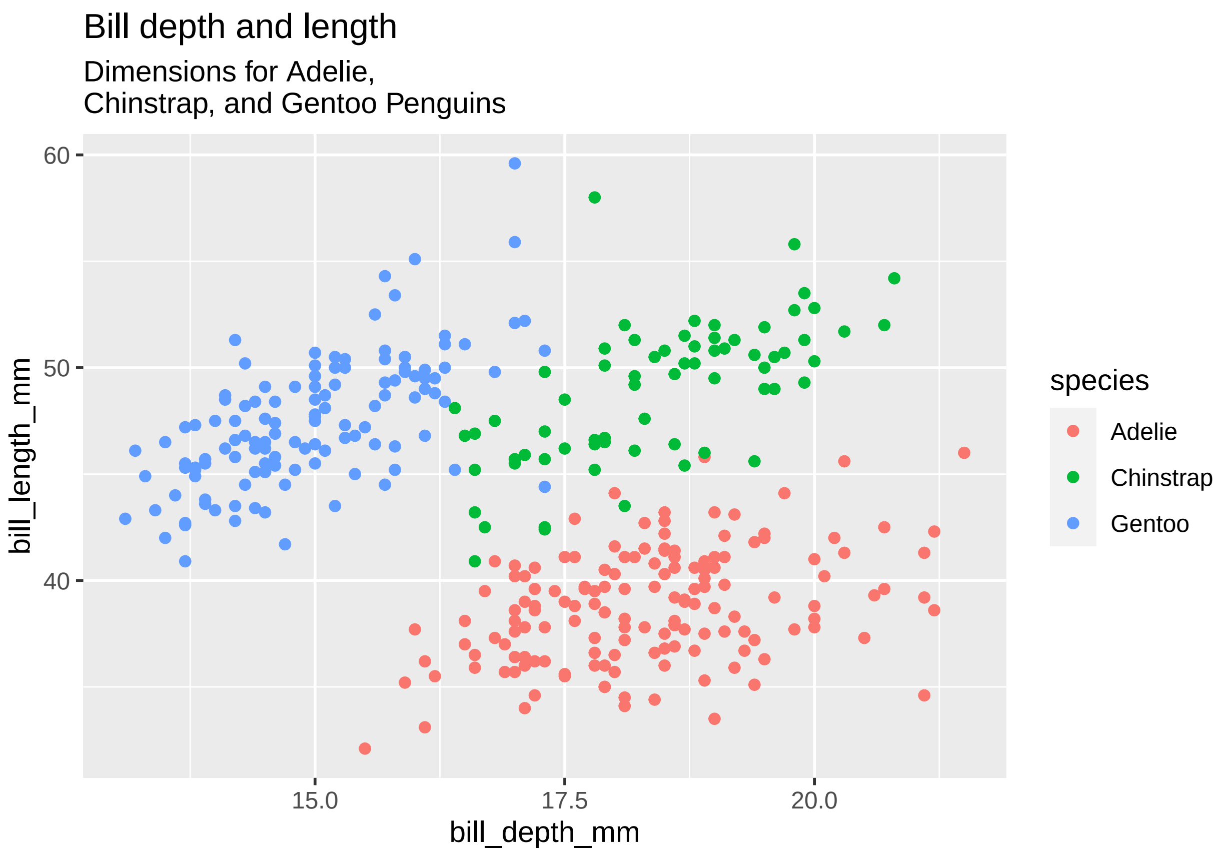


```
#title the plot
```

g. Add the subtitle “Dimensions for Adelie, Chinstrap, and Gentoo Penguins”

```
ggplot(data = penguins,
mapping = aes(x = bill_depth_mm,
y = bill_length_mm,
colour = species)) +
geom_point() +
labs(title = "Bill depth and length",
subtitle = "Dimensions for Adelie,
Chinstrap, and Gentoo Penguins")
```

```
## Warning: Removed 2 rows containing missing values (‘geom_point()‘).
```

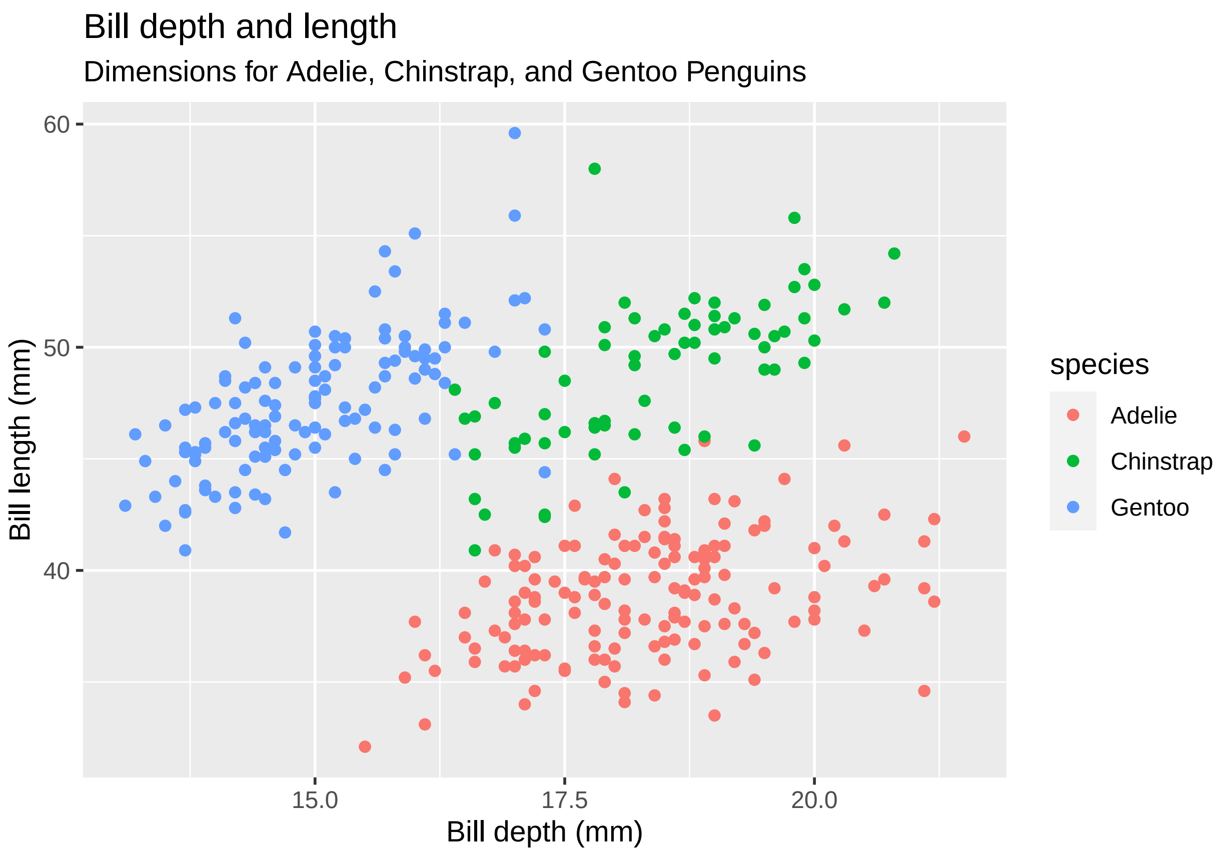


```
#add subtitle
```

h. Label the x and y axes as “Bill depth (mm)” and “Bill length (mm)”, respectively

```
ggplot(data = penguins,
 mapping = aes(x = bill_depth_mm,
 y = bill_length_mm,
 colour = species)) +
 geom_point() +
 labs(title = "Bill depth and length",
subtitle = "Dimensions for Adelie, Chinstrap, and Gentoo Penguins",
 x = "Bill depth (mm)",
 y = "Bill length (mm)")
```

```
## Warning: Removed 2 rows containing missing values (‘geom_point()‘).
```

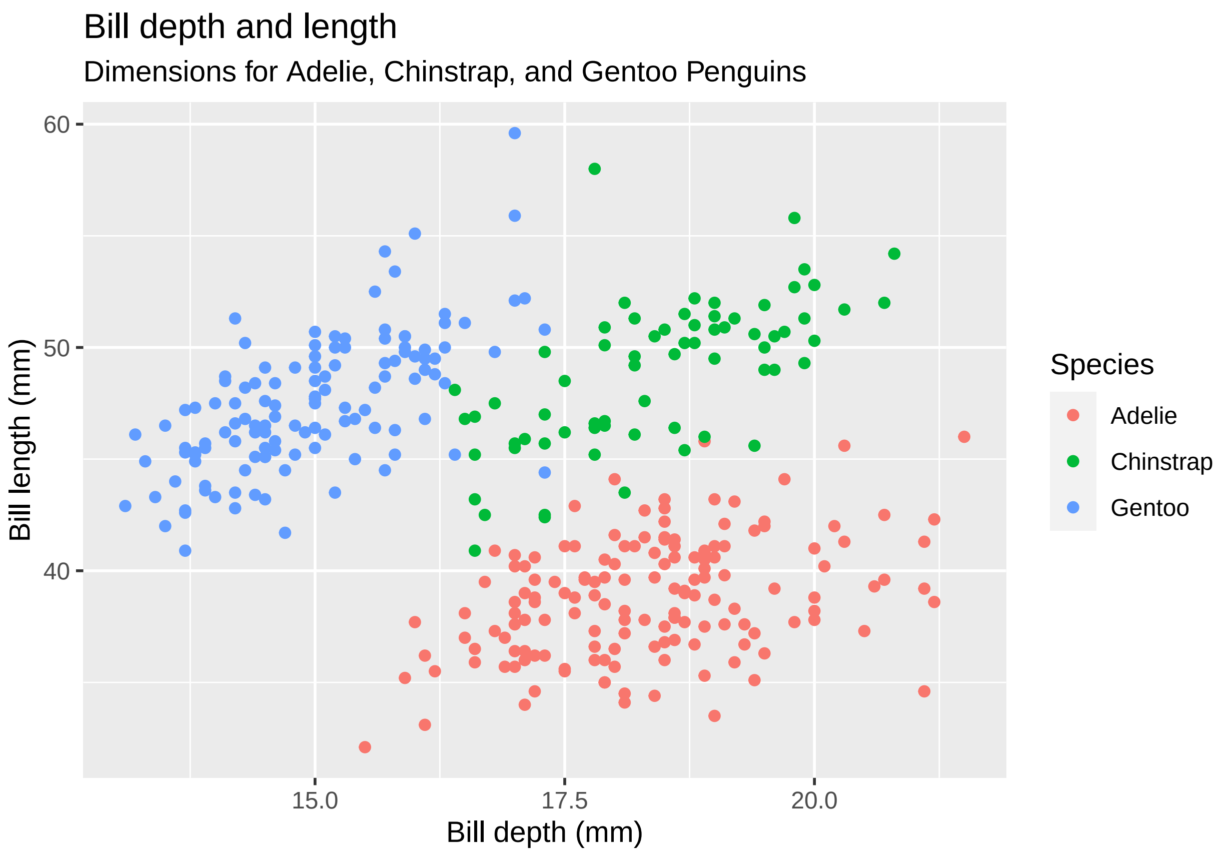


```
#label x and y axis
```

i. Label the legend “Species”

```
ggplot(data = penguins,
 mapping = aes(x = bill_depth_mm,
 y = bill_length_mm,
 colour = species)) +
 geom_point() +
 labs(title = "Bill depth and length",
 subtitle = "Dimensions for Adelie, Chinstrap, and Gentoo Penguins",
 x = "Bill depth (mm)", y = "Bill length (mm)",
 colour = "Species")
```

```
## Warning: Removed 2 rows containing missing values (‘geom_point()‘).
```

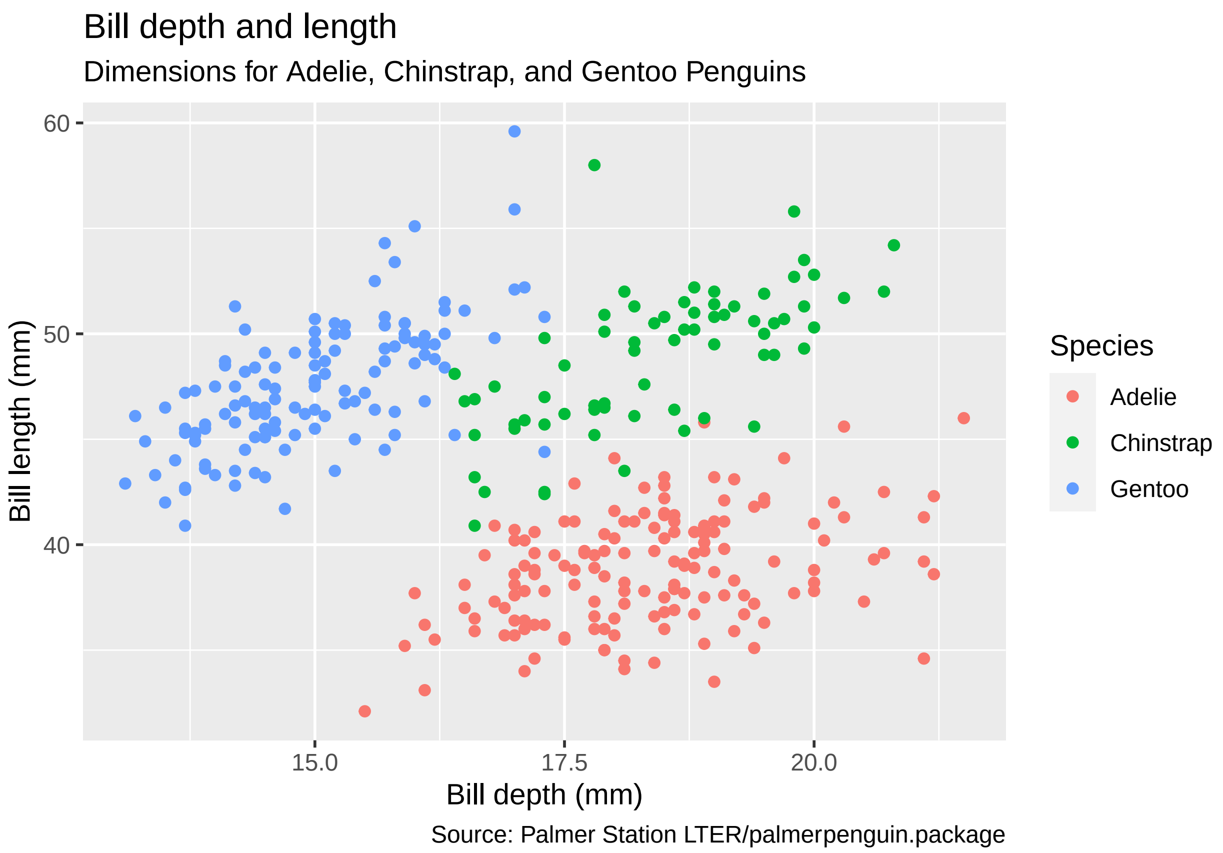


```
#label legend
```

j. Add a caption for the data source

```
ggplot(data = penguins,
 mapping = aes(x = bill_depth_mm,
 y = bill_length_mm,
 colour = species)) +
 geom_point() +
 labs(title = "Bill depth and length",
 subtitle = "Dimensions for Adelie, Chinstrap, and Gentoo Penguins",
 x = "Bill depth (mm)", y = "Bill length (mm)",
 colour = "Species",
 caption = "Source: Palmer Station LTER/palmerpenguin.package")
```

```
## Warning: Removed 2 rows containing missing values (‘geom_point()‘).
```

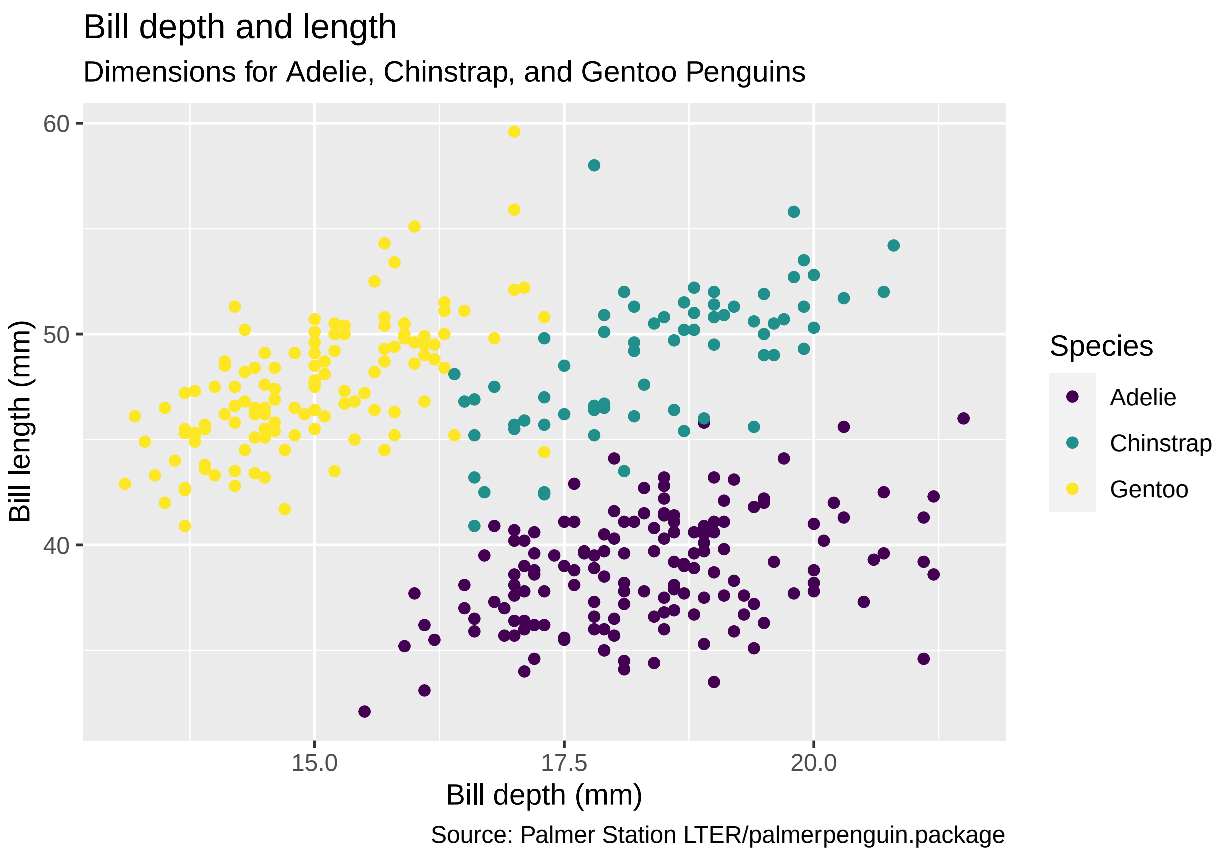


```
#add caption
```

k. Finally, use a discrete colour scale that is designed to be perceived by viewers with common forms of colour blindness.

```
ggplot(data = penguins,
 mapping = aes(x = bill_depth_mm,
 y = bill_length_mm,
 colour = species)) +
 geom_point() +
 labs(title = "Bill depth and length",
 subtitle = "Dimensions for Adelie, Chinstrap, and Gentoo Penguins",
 x = "Bill depth (mm)", y = "Bill length (mm)",
 colour = "Species",
 caption = "Source: Palmer Station LTER/palmerpenguin.package") +
 scale_colour_viridis_d()
```

```
## Warning: Removed 2 rows containing missing values (‘geom_point()‘).
```

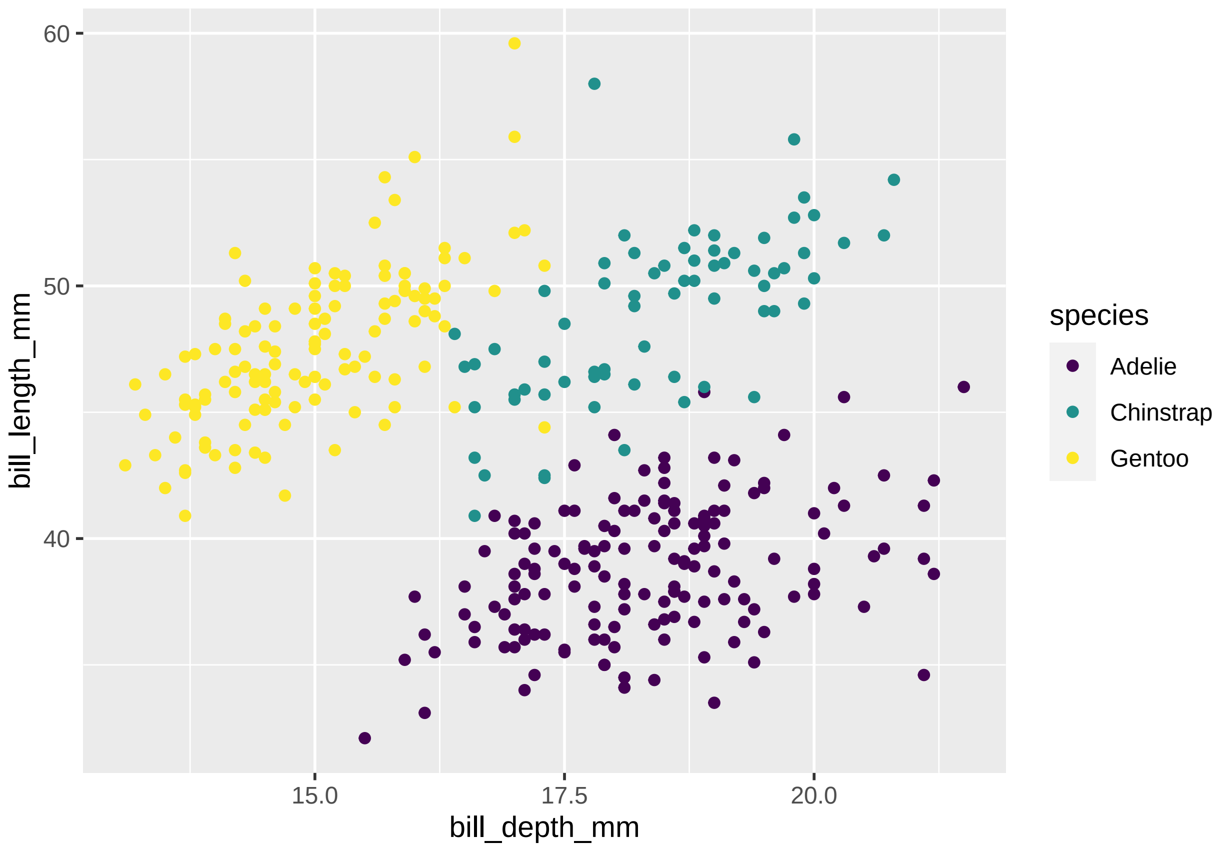


```
#change colour scale of points
```

Can omit the names of first two arguments when building plots with ggplot()

```
#first way of writing the code
ggplot(data = penguins,
 mapping = aes(x = bill_depth_mm,
 y = bill_length_mm,
 colour = species)) +
 geom_point() +
 scale_colour_viridis_d()
```

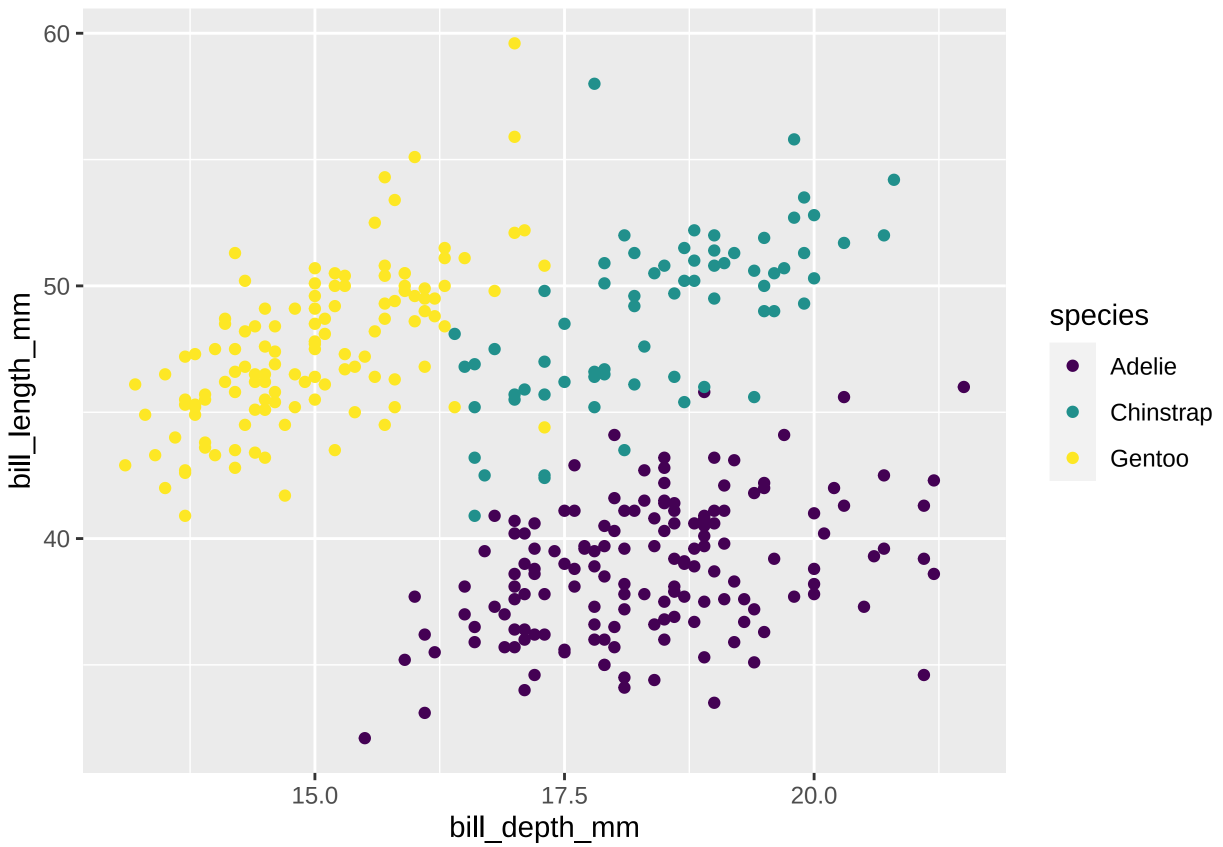
```
## Warning: Removed 2 rows containing missing values (‘geom_point()‘).
```



vs

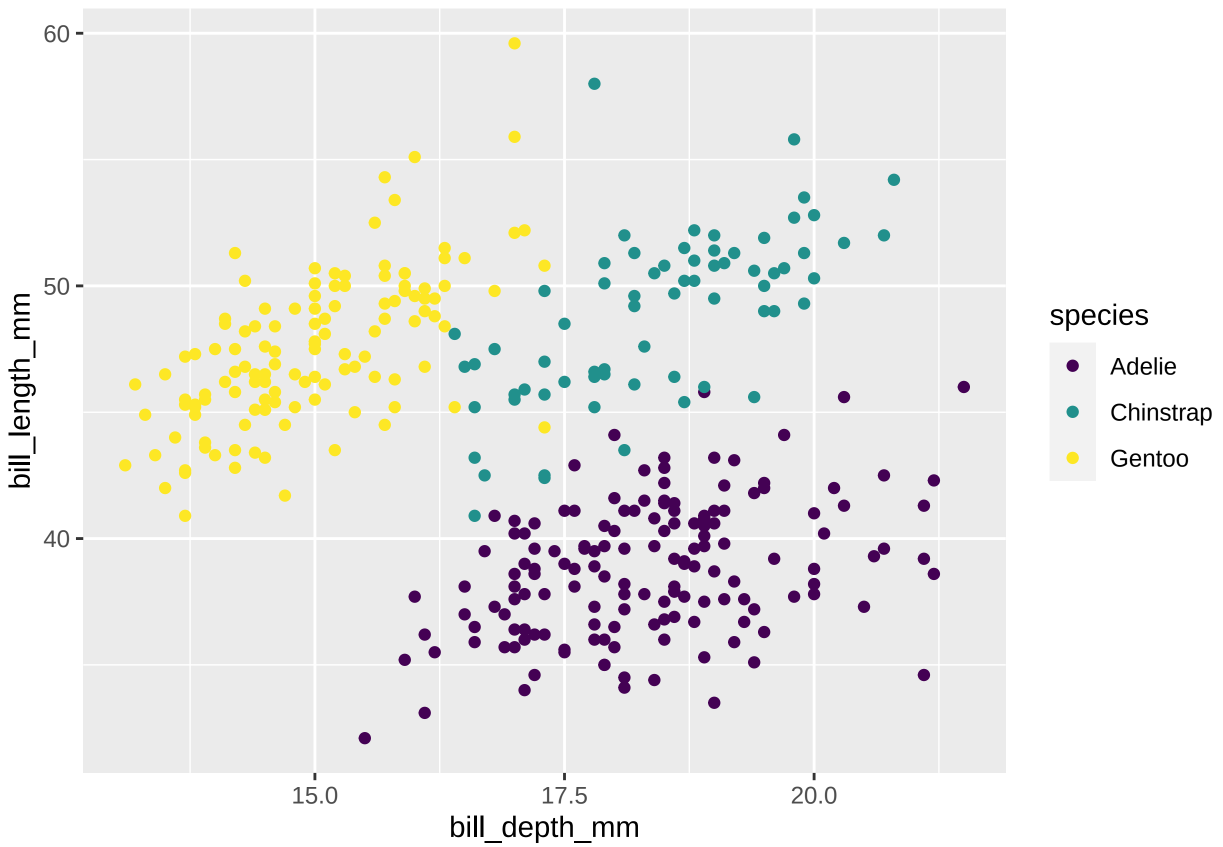
```
#second way of writing the code
ggplot(penguins) + # Data layer
 aes(x = bill_depth_mm,
 y = bill_length_mm,
 colour = species) + # Aesthetics layer
 geom_point() + # Geometric layer
 scale_colour_viridis_d()
```

```
## Warning: Removed 2 rows containing missing values (‘geom_point()‘).
```



vs

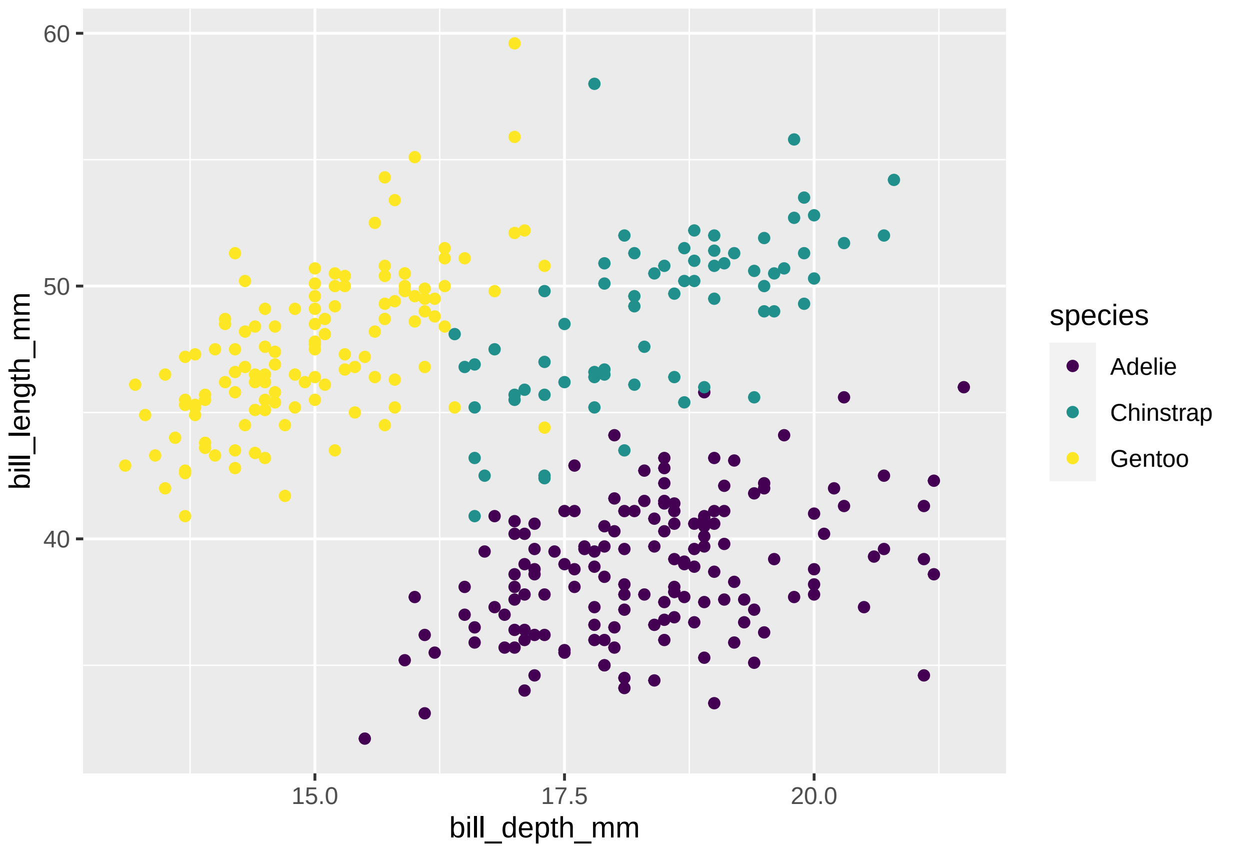
```
## Warning: Removed 2 rows containing missing values (‘geom_point()‘).
```



Palmer Penguins: Colour

```
ggplot(penguins) + aes(x = bill_depth_mm, y = bill_length_mm,
 colour = species) + geom_point() + scale_colour_viridis_d()
```

```
## Warning: Removed 2 rows containing missing values (‘geom_point()‘).
```



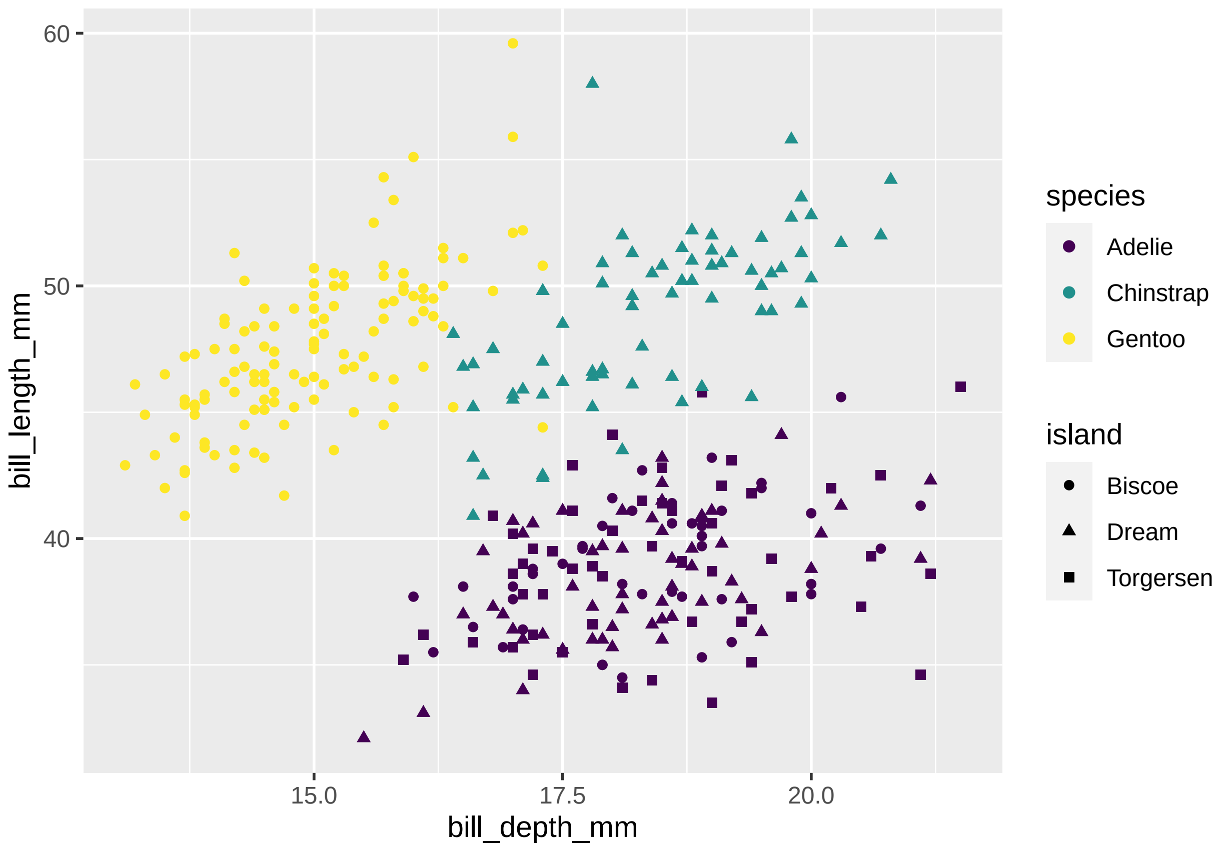
```r
#map colour to species
```

Palmer Penguins: Shape

Island

```r
ggplot(penguins, aes(x = bill_depth_mm, y = bill_length_mm, colour = species,
 shape = island)) + geom_point() + scale_colour_viridis_d()
```

```
## Warning: Removed 2 rows containing missing values (‘geom_point()‘).
```

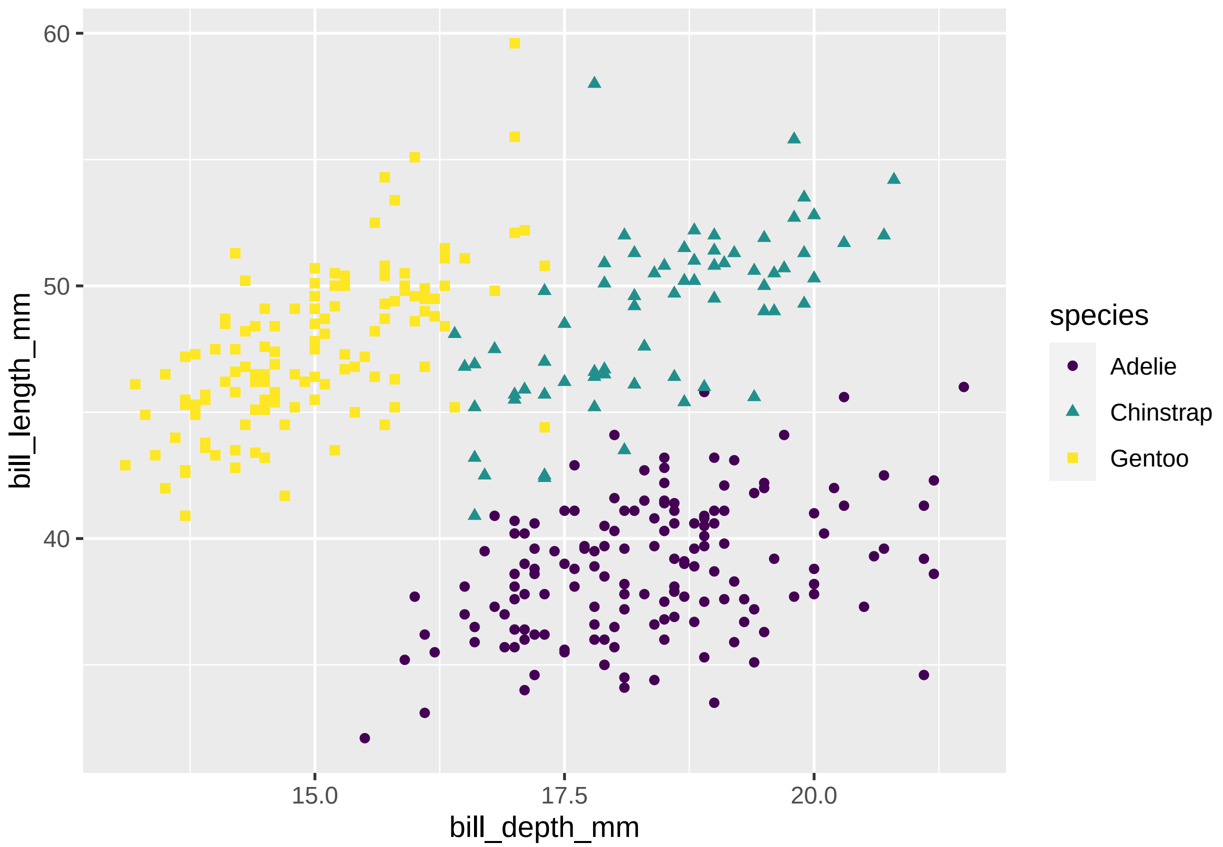


```
#map shape to island
```

Species

```
ggplot(penguins, aes(x = bill_depth_mm, y = bill_length_mm, colour = species,
 shape = species)) + geom_point() + scale_colour_viridis_d()
```

```
## Warning: Removed 2 rows containing missing values (‘geom_point()‘).
```

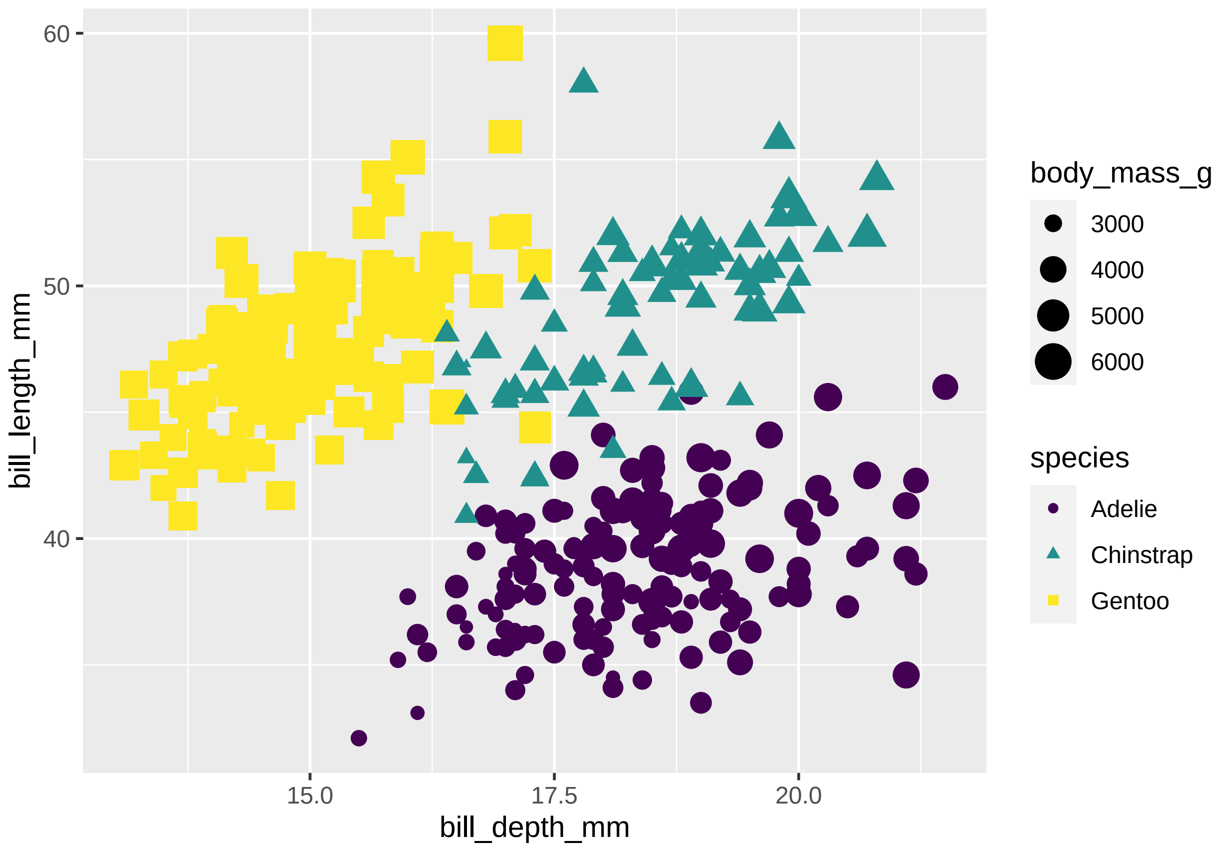


```
#map shape and colour to species
```

Size

```
ggplot(penguins, aes(x = bill_depth_mm, y = bill_length_mm, colour = species, shape = species,
 size = body_mass_g)) + geom_point() + scale_colour_viridis_d()
```

```
## Warning: Removed 2 rows containing missing values (‘geom_point()‘).
```

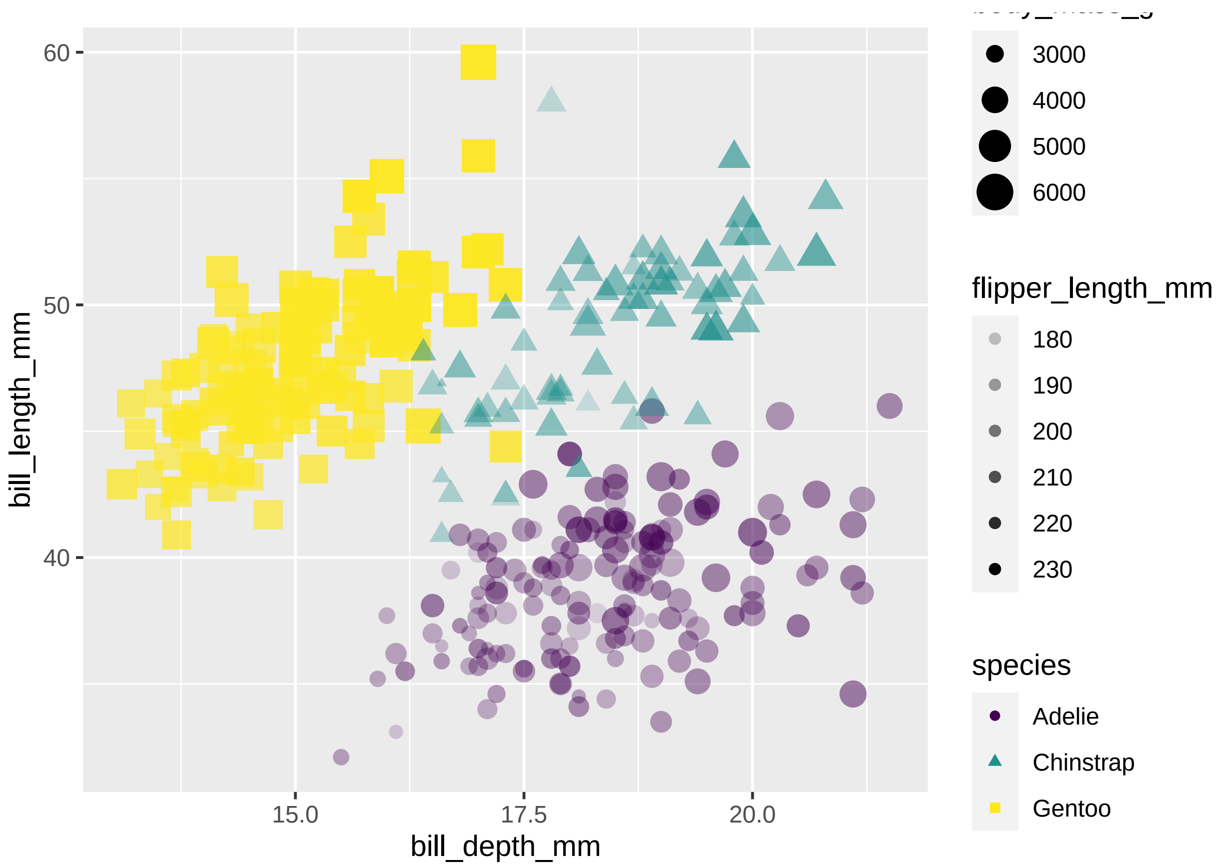


```
#map shape and colour to size
```

Alpha

```
ggplot(penguins, aes(x = bill_depth_mm, y = bill_length_mm, colour = species,
 shape = species, size = body_mass_g, alpha = flipper_length_mm)) +
 geom_point() + scale_colour_viridis_d()
```

```
## Warning: Removed 2 rows containing missing values (‘geom_point()‘).
```



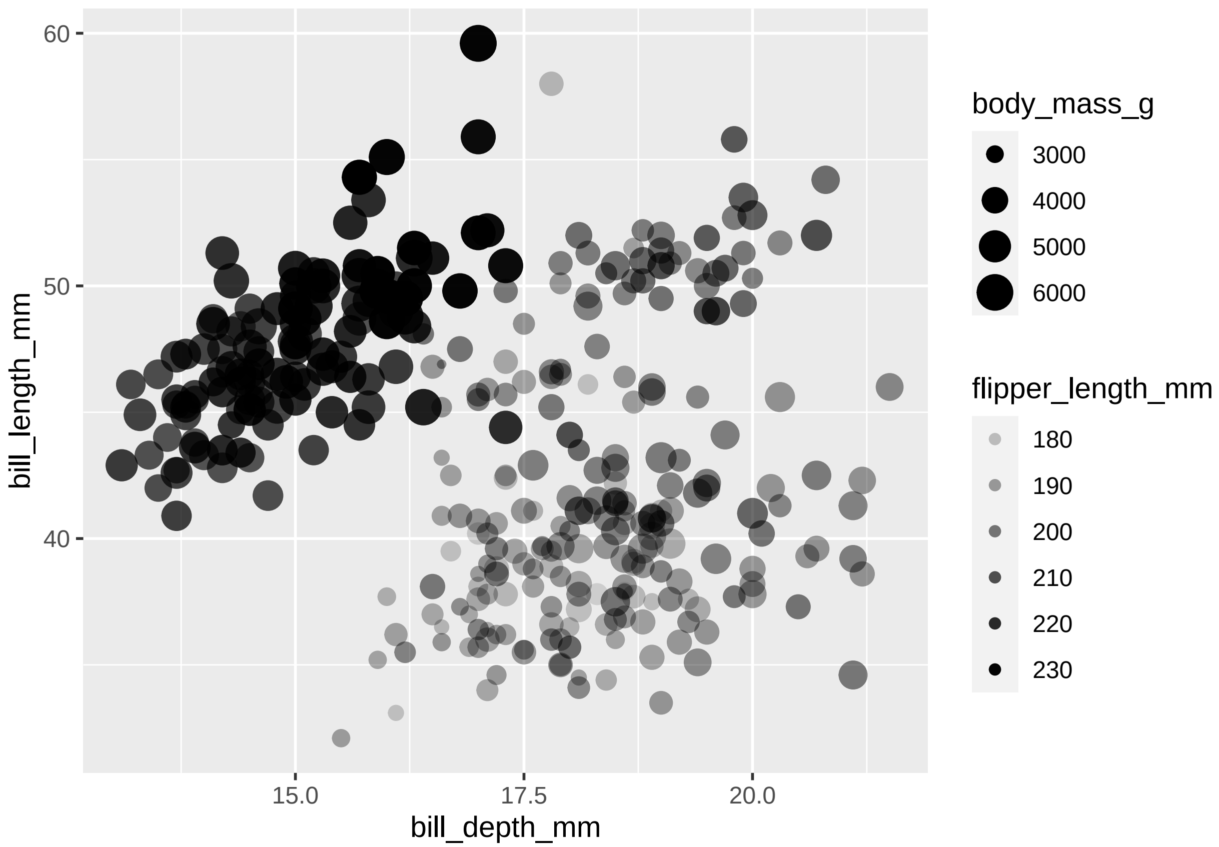
```r
#add transparency
```

Mapping vs Setting

Mapping

```r
#map size and transparency according o bill length and body length respectively
ggplot(penguins) +
 aes(x = bill_depth_mm,
 y = bill_length_mm,
 size = body_mass_g,
 alpha = flipper_length_mm) +
 geom_point()
```

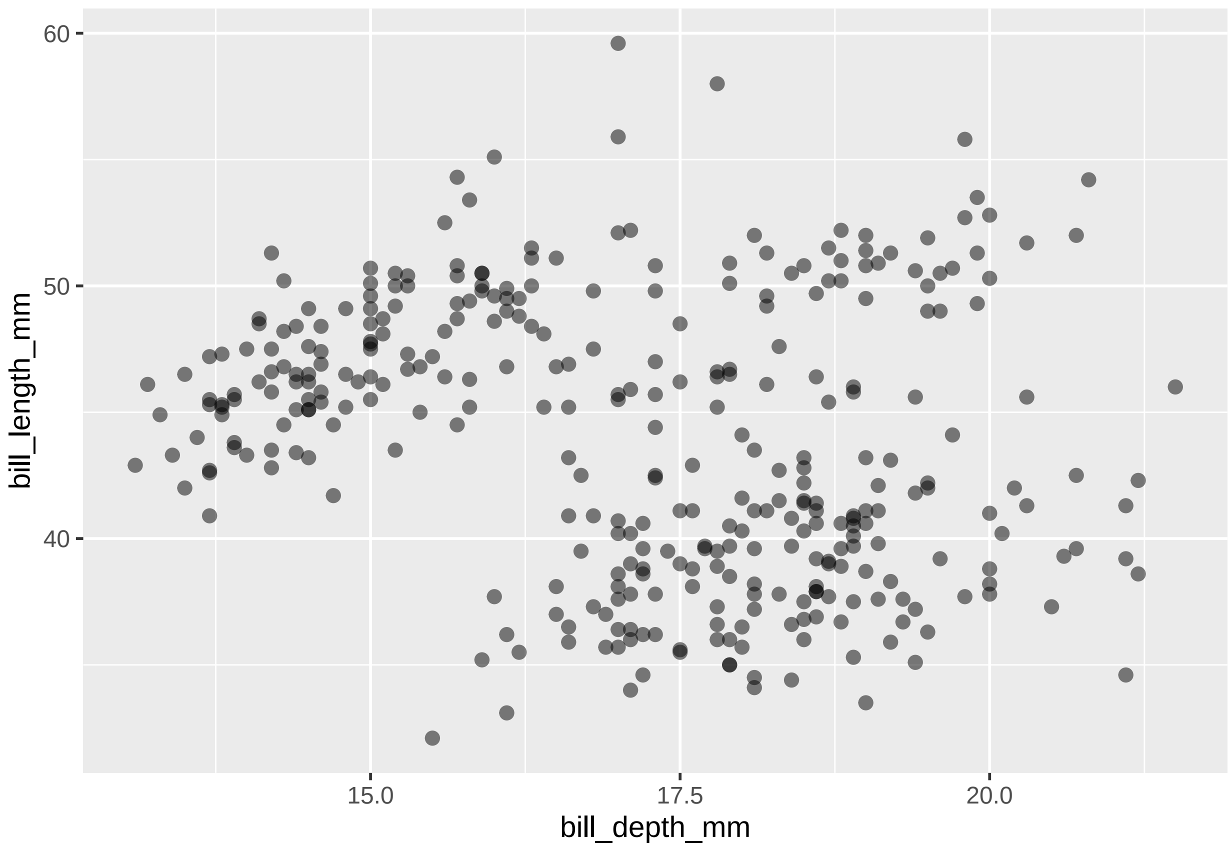
```
## Warning: Removed 2 rows containing missing values (‘geom_point()‘).
```



Setting

```
#set point size = 2 and transparency to 0.5
ggplot(penguins) +
 aes(x = bill_depth_mm,
 y = bill_length_mm) +
 geom_point(size = 2, alpha = 0.5)
```

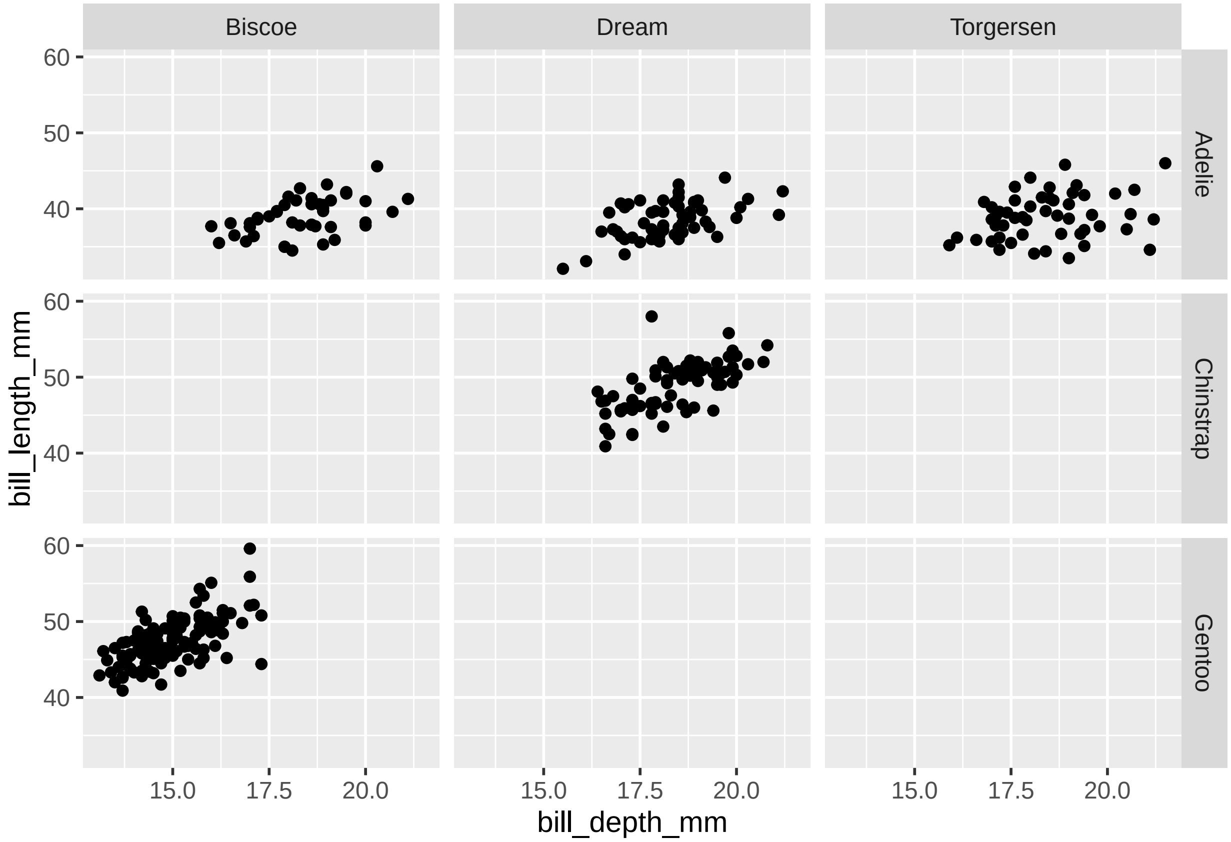
```
## Warning: Removed 2 rows containing missing values (‘geom_point()‘).
```



Faceting

```r
ggplot(penguins) +
 aes(x = bill_depth_mm,
 y = bill_length_mm) +
 geom_point() +
 facet_grid(species ~ island)
```

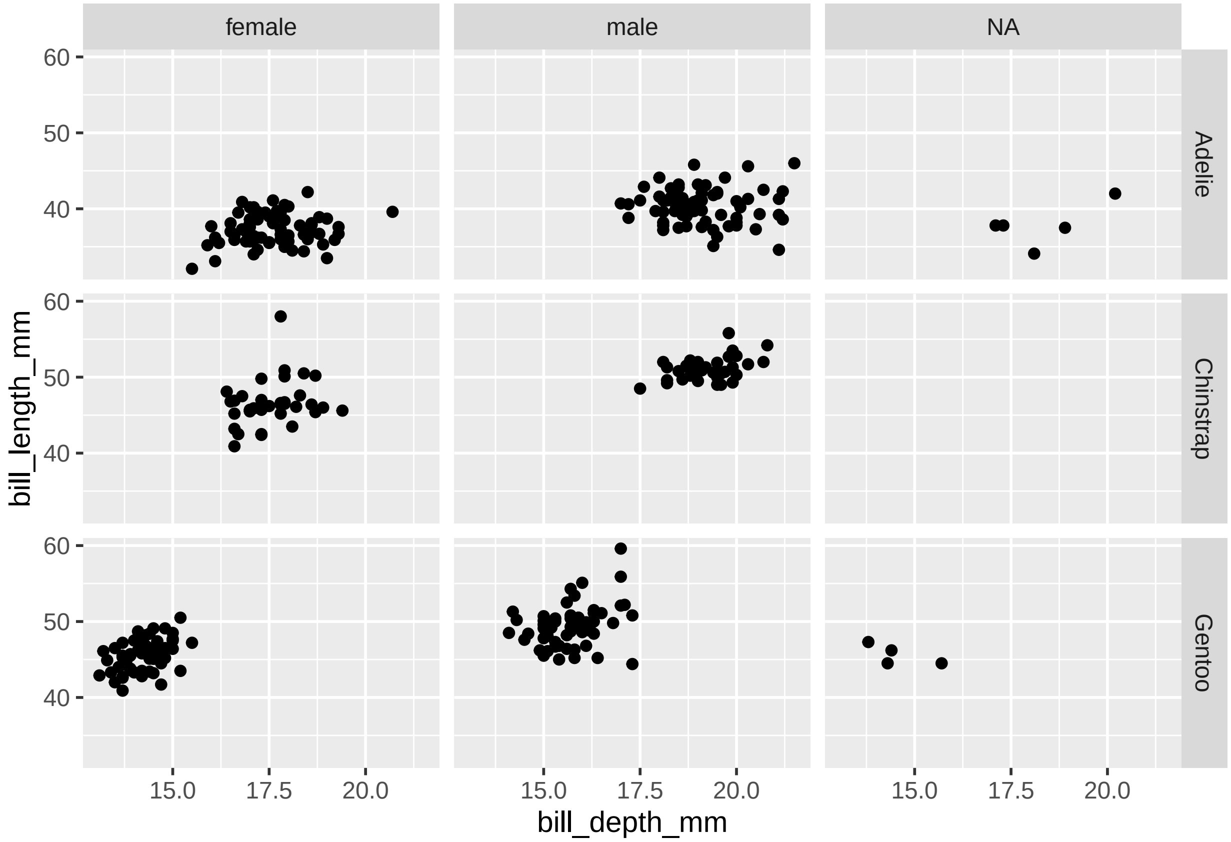
```
## Warning: Removed 2 rows containing missing values (‘geom_point()‘).
```



```
#separate the plot according to each species against each island
```

```
ggplot(penguins, aes(x = bill_depth_mm, y = bill_length_mm)) + geom_point() +
 facet_grid(species ~ sex)
```

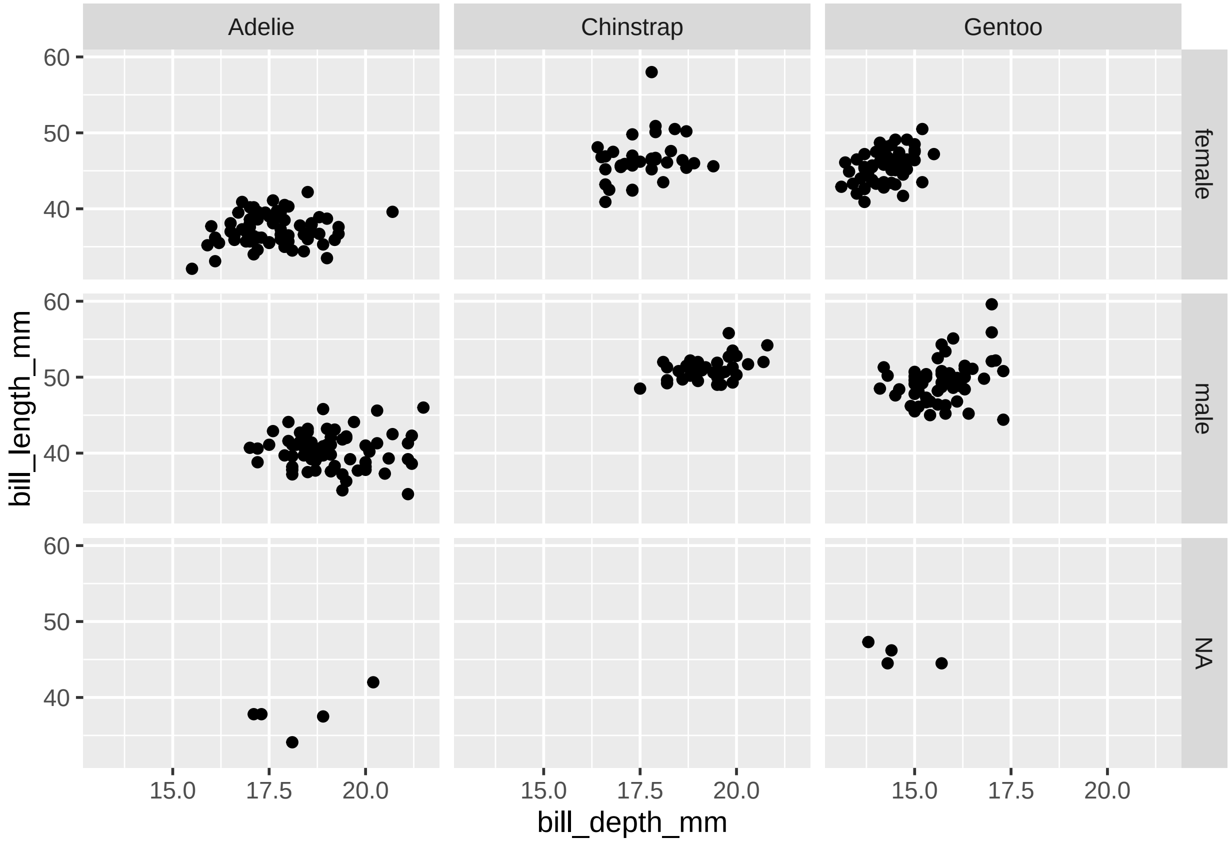
```
## Warning: Removed 2 rows containing missing values (‘geom_point()‘).
```



```
#separate the plot according to each species against each gender
```

```
ggplot(penguins, aes(x = bill_depth_mm, y = bill_length_mm)) + geom_point() +
 facet_grid(sex ~ species)
```

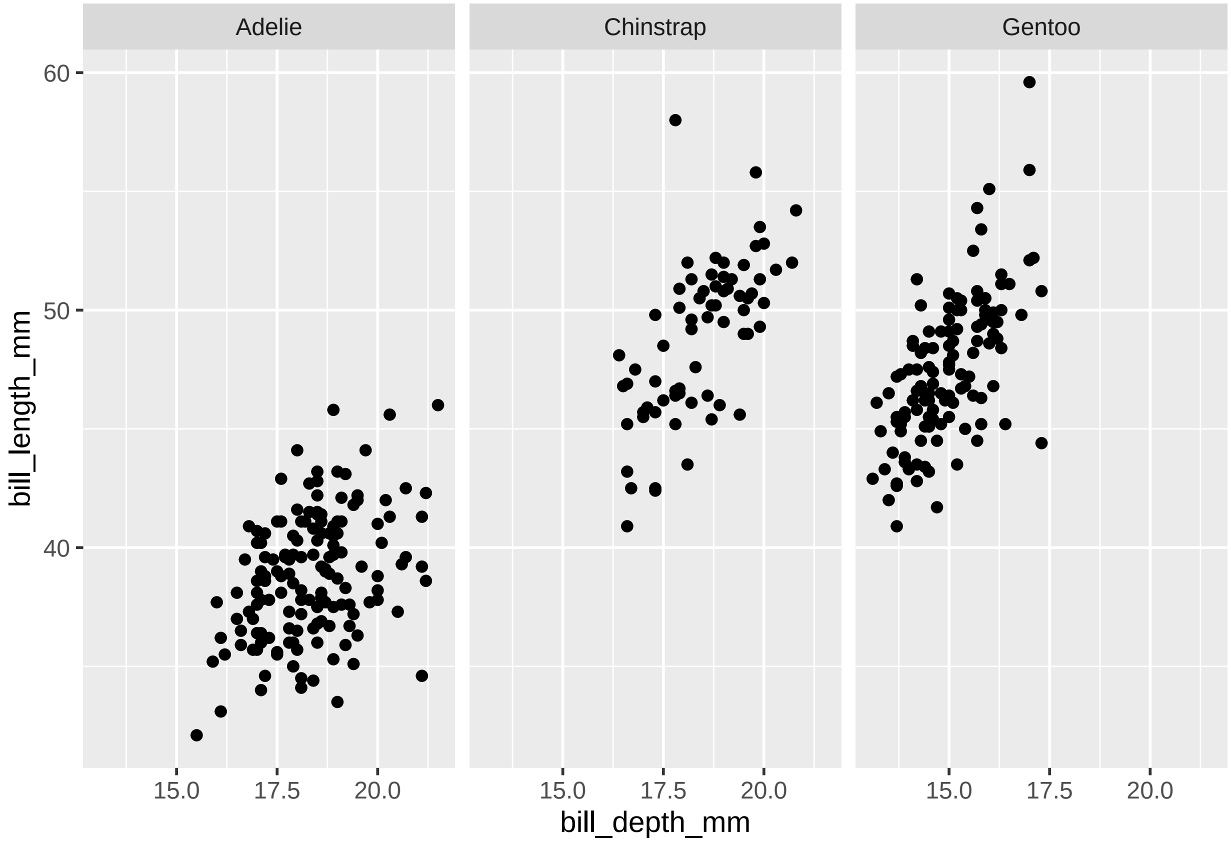
```
## Warning: Removed 2 rows containing missing values (`geom_point()`).
```



```
#separate the plot according to each gender against each species
```

```
ggplot(penguins, aes(x = bill_depth_mm, y = bill_length_mm)) + geom_point() +
 facet_wrap(~ species)
```

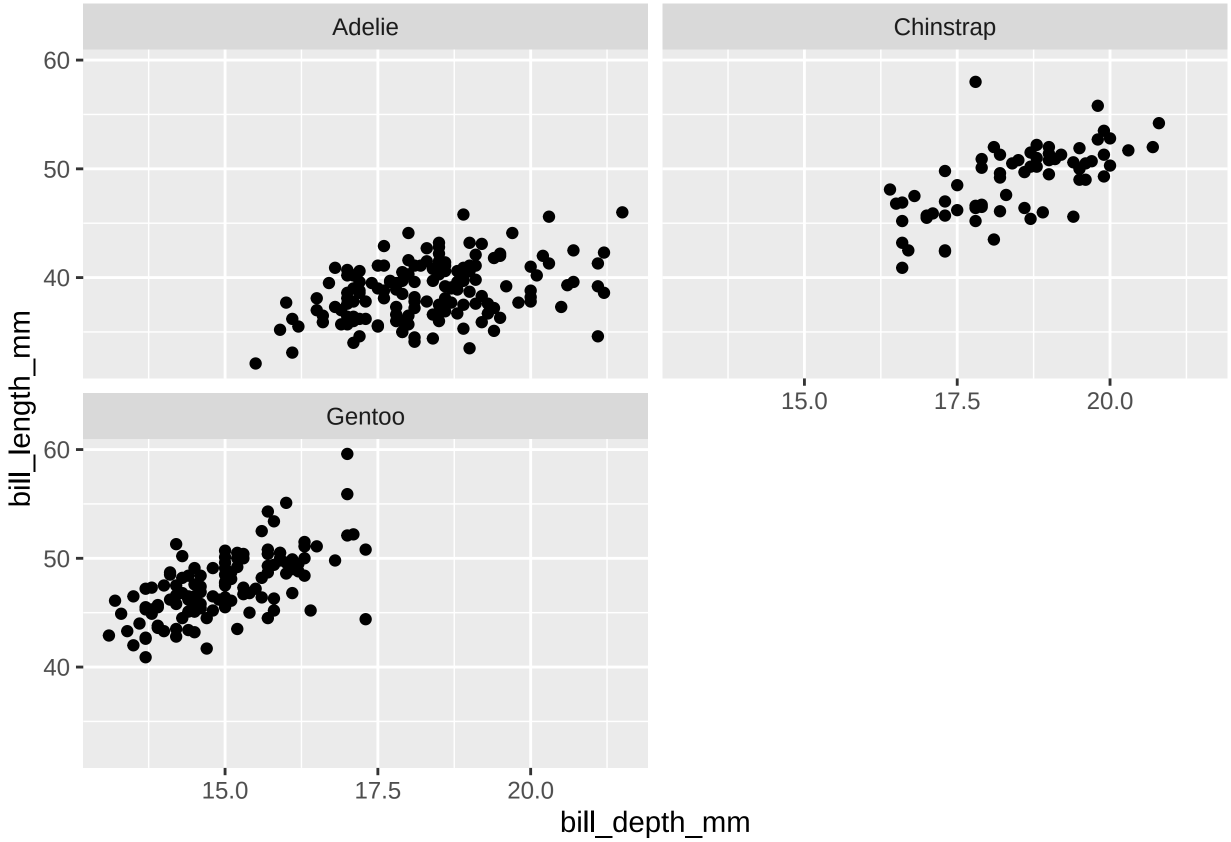
```
## Warning: Removed 2 rows containing missing values (‘geom_point()‘).
```



```
#separate the plot according to species
```

```
ggplot(penguins, aes(x = bill_depth_mm, y = bill_length_mm)) + geom_point() +
 facet_wrap(~ species, ncol = 2)
```

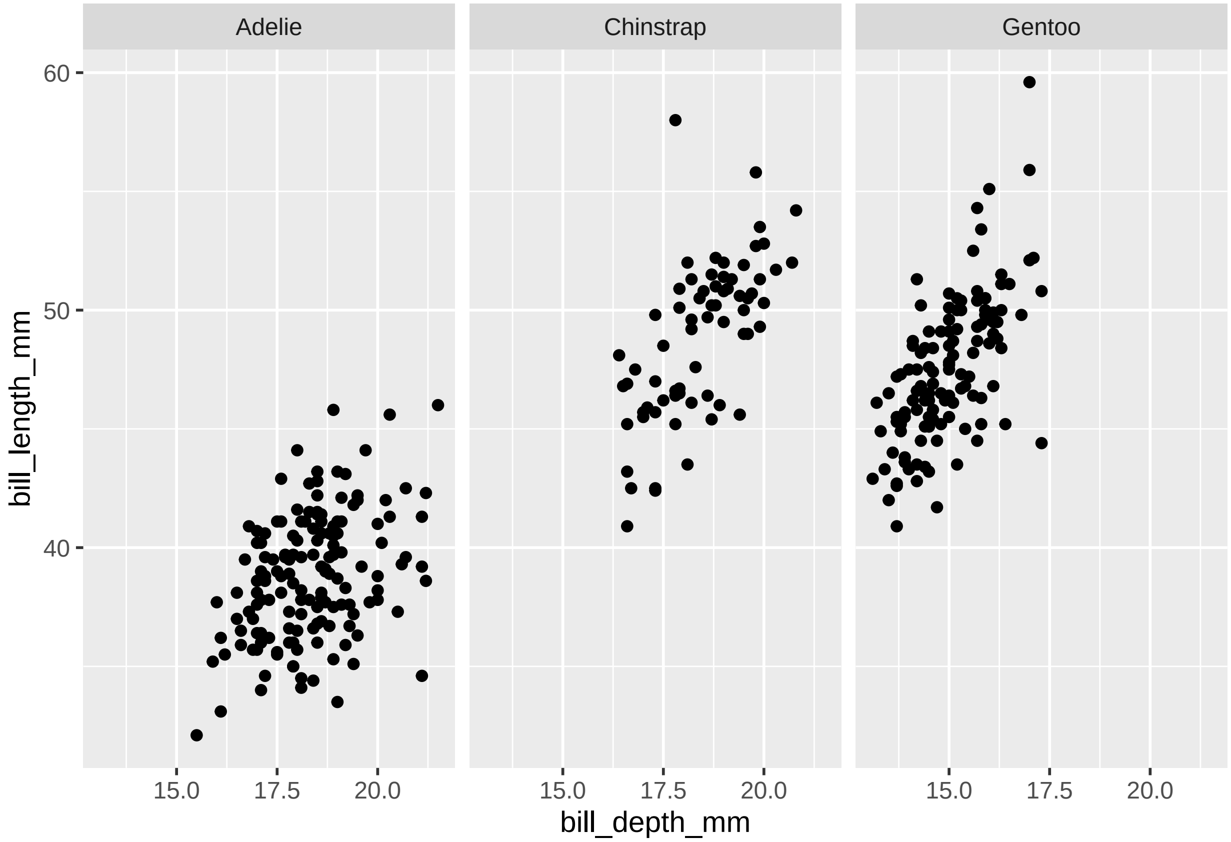
```
## Warning: Removed 2 rows containing missing values (‘geom_point()‘).
```



```
#separate the plot according by each species, in 2 columns
```

```
ggplot(penguins, aes(x = bill_depth_mm, y = bill_length_mm)) + geom_point() +
 facet_grid(. ~ species)
```

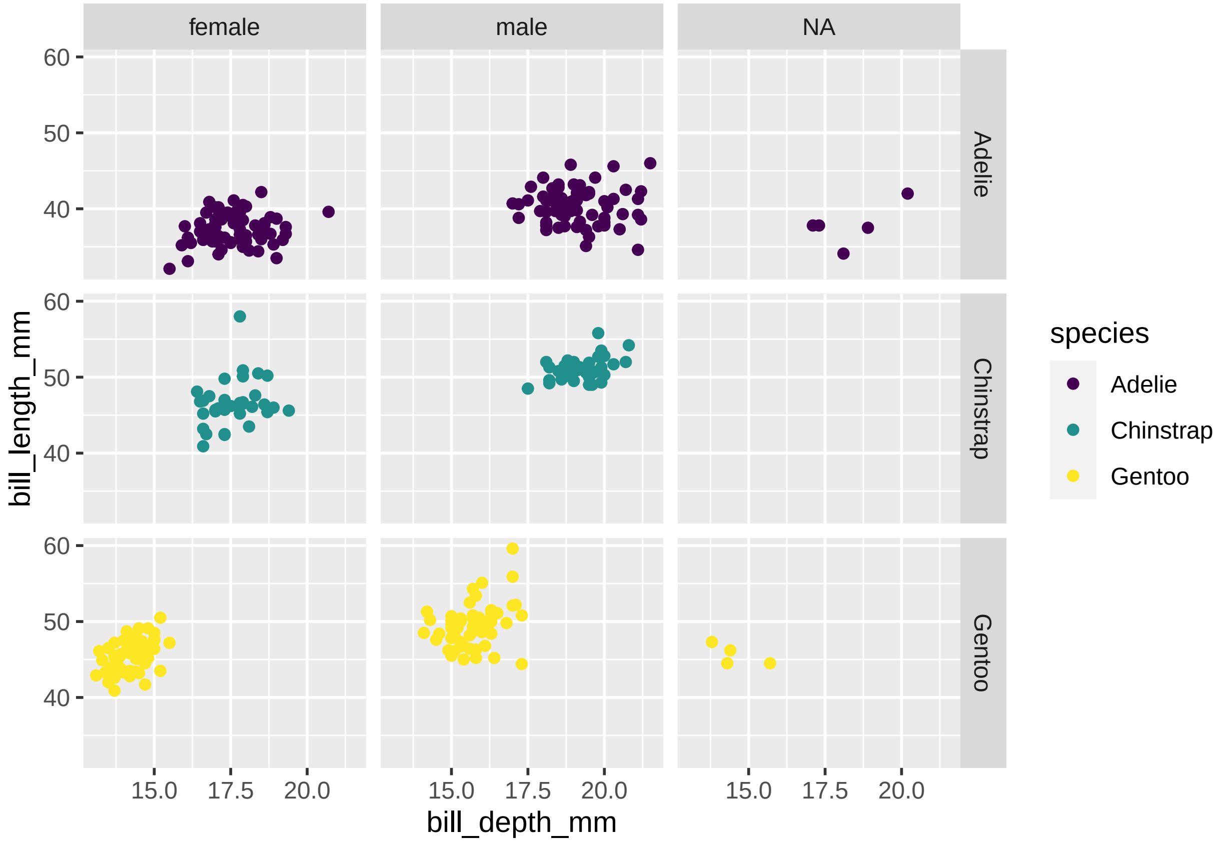
```
## Warning: Removed 2 rows containing missing values (‘geom_point()‘).
```



```
#use facet_grid to separate the plot by each species. "." is used to replace the y variable in the face
```

```
ggplot(penguins, aes(x = bill_depth_mm, y = bill_length_mm, color = species)) +
 geom_point() + facet_grid(species ~ sex) + scale_color_viridis_d()
```

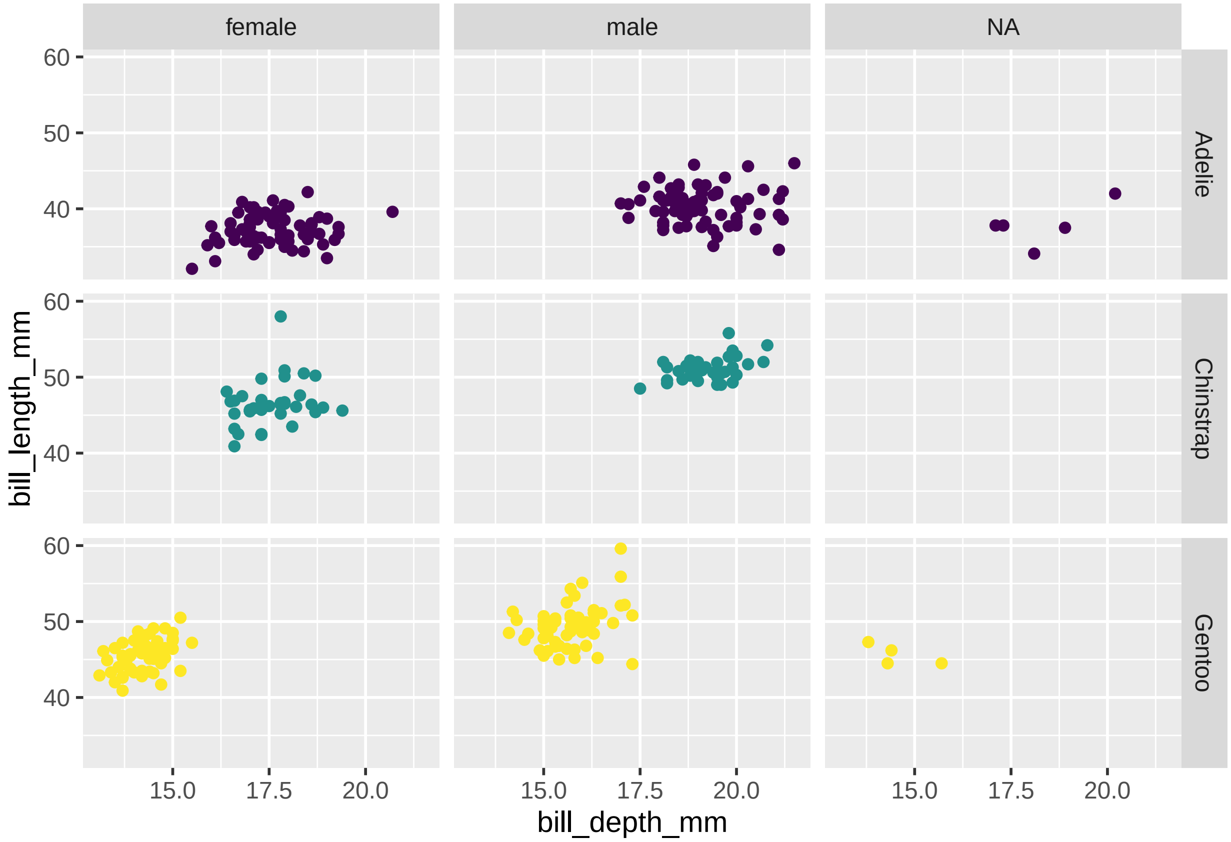
```
## Warning: Removed 2 rows containing missing values (‘geom_point()‘).
```



```r
##separate the plot according to each species against gender colour each species
```

```r
ggplot(penguins, aes(x = bill_depth_mm, y = bill_length_mm, color = species)) +
 geom_point() + facet_grid(species ~ sex) + scale_color_viridis_d() +
 guides(color = "none") #remove colour legend
```

```
## Warning: Removed 2 rows containing missing values (‘geom_point()‘).
```



Data 2: Lending Club

Take a peek at data

```
library(openintro) #load package openintro
```

```
## Warning: package 'openintro' was built under R version 4.2.3
```

```
## Loading required package: airports
```

```
## Warning: package 'airports' was built under R version 4.2.3
```

```
## Loading required package: cherryblossom
```

```
## Warning: package 'cherryblossom' was built under R version 4.2.3
```

```
## Loading required package: usdata
```

```
## Warning: package 'usdata' was built under R version 4.2.3
```

```r
glimpse(loans_full_schema) #see the columns of dataset stacked on top of one another
```

```
## Rows: 10,000
## Columns: 55
## $ emp_title                        <chr> "global config engineer ", "warehouse~
## $ emp_length                       <dbl> 3, 10, 3, 1, 10, NA, 10, 10, 10, 3, 1~
## $ state                            <fct> NJ, HI, WI, PA, CA, KY, MI, AZ, NV, I~
## $ homeownership                    <fct> MORTGAGE, RENT, RENT, RENT, RENT, OWN~
## $ annual_income                    <dbl> 90000, 40000, 40000, 30000, 35000, 34~
## $ verified_income                  <fct> Verified, Not Verified, Source Verifi~
## $ debt_to_income                   <dbl> 18.01, 5.04, 21.15, 10.16, 57.96, 6.4~
## $ annual_income_joint              <dbl> NA, NA, NA, NA, 57000, NA, 155000, NA~
## $ verification_income_joint        <fct> , , , , Verified, , Not Verified, , ,~
## $ debt_to_income_joint             <dbl> NA, NA, NA, NA, 37.66, NA, 13.12, NA,~
## $ delinq_2y                        <int> 0, 0, 0, 0, 0, 1, 0, 1, 1, 0, 0, 0, 0~
## $ months_since_last_delinq         <int> 38, NA, 28, NA, NA, 3, NA, 19, 18, NA~
## $ earliest_credit_line             <dbl> 2001, 1996, 2006, 2007, 2008, 1990, 2~
## $ inquiries_last_12m               <int> 6, 1, 4, 0, 7, 6, 1, 1, 3, 0, 4, 4, 8~
## $ total_credit_lines               <int> 28, 30, 31, 4, 22, 32, 12, 30, 35, 9,~
## $ open_credit_lines                <int> 10, 14, 10, 4, 16, 12, 10, 15, 21, 6,~
## $ total_credit_limit               <int> 70795, 28800, 24193, 25400, 69839, 42~
## $ total_credit_utilized            <int> 38767, 4321, 16000, 4997, 52722, 3898~
## $ num_collections_last_12m         <int> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0~
## $ num_historical_failed_to_pay     <int> 0, 1, 0, 1, 0, 0, 0, 0, 0, 0, 1, 0, 0~
## $ months_since_90d_late            <int> 38, NA, 28, NA, NA, 60, NA, 71, 18, N~
## $ current_accounts_delinq          <int> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0~
## $ total_collection_amount_ever     <int> 1250, 0, 432, 0, 0, 0, 0, 0, 0, 0, 0,~
## $ current_installment_accounts     <int> 2, 0, 1, 1, 1, 0, 2, 2, 6, 1, 2, 1, 2~
## $ accounts_opened_24m              <int> 5, 11, 13, 1, 6, 2, 1, 4, 10, 5, 6, 7~
## $ months_since_last_credit_inquiry <int> 5, 8, 7, 15, 4, 5, 9, 7, 4, 17, 3, 4,~
## $ num_satisfactory_accounts        <int> 10, 14, 10, 4, 16, 12, 10, 15, 21, 6,~
## $ num_accounts_120d_past_due       <int> 0, 0, 0, 0, 0, 0, 0, NA, 0, 0, 0, 0, ~
## $ num_accounts_30d_past_due        <int> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0~
## $ num_active_debit_accounts        <int> 2, 3, 3, 2, 10, 1, 3, 5, 11, 3, 2, 2,~
## $ total_debit_limit                <int> 11100, 16500, 4300, 19400, 32700, 272~
## $ num_total_cc_accounts            <int> 14, 24, 14, 3, 20, 27, 8, 16, 19, 7, ~
## $ num_open_cc_accounts             <int> 8, 14, 8, 3, 15, 12, 7, 12, 14, 5, 8,~
## $ num_cc_carrying_balance          <int> 6, 4, 6, 2, 13, 5, 6, 10, 14, 3, 5, 3~
## $ num_mort_accounts                <int> 1, 0, 0, 0, 0, 3, 2, 7, 2, 0, 2, 3, 3~
## $ account_never_delinq_percent     <dbl> 92.9, 100.0, 93.5, 100.0, 100.0, 78.1~
## $ tax_liens                        <int> 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0~
## $ public_record_bankrupt           <int> 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0~
## $ loan_purpose                     <fct> moving, debt_consolidation, other, de~
## $ application_type                 <fct> individual, individual, individual, i~
## $ loan_amount                      <int> 28000, 5000, 2000, 21600, 23000, 5000~
## $ term                             <dbl> 60, 36, 36, 36, 36, 36, 60, 60, 36, 3~
## $ interest_rate                    <dbl> 14.07, 12.61, 17.09, 6.72, 14.07, 6.7~
## $ installment                      <dbl> 652.53, 167.54, 71.40, 664.19, 786.87~
## $ grade                            <fct> C, C, D, A, C, A, C, B, C, A, C, B, C~
## $ sub_grade                        <fct> C3, C1, D1, A3, C3, A3, C2, B5, C2, A~
## $ issue_month                      <fct> Mar-2018, Feb-2018, Feb-2018, Jan-201~
## $ loan_status                      <fct> Current, Current, Current, Current, C~
## $ initial_listing_status           <fct> whole, whole, fractional, whole, whol~
## $ disbursement_method              <fct> Cash, Cash, Cash, Cash, Cash, Cash, C~
## $ balance                          <dbl> 27015.86, 4651.37, 1824.63, 18853.26,~
## $ paid_total                       <dbl> 1999.330, 499.120, 281.800, 3312.890,~
## $ paid_principal                   <dbl> 984.14, 348.63, 175.37, 2746.74, 1569~
## $ paid_interest                    <dbl> 1015.19, 150.49, 106.43, 566.15, 754.~
## $ paid_late_fees                   <dbl> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0~
```

Selected variables

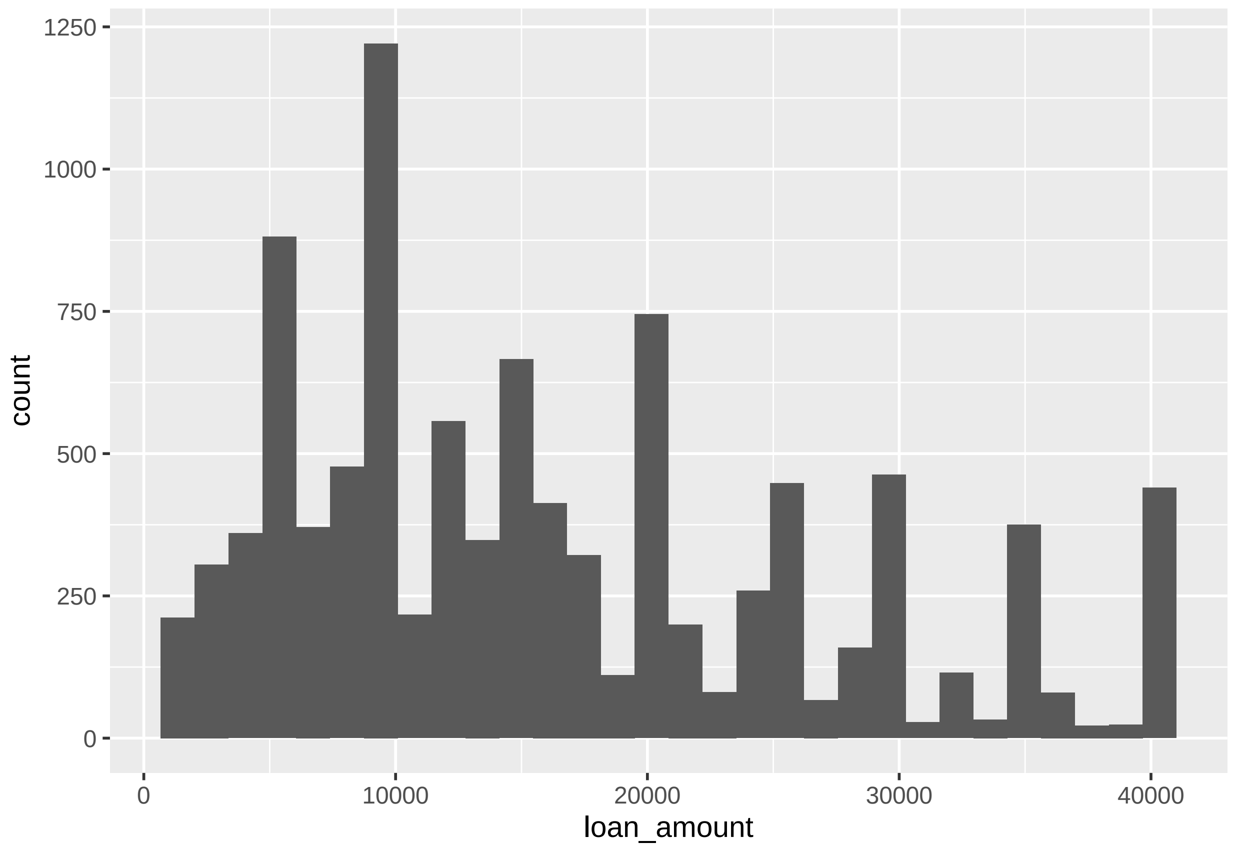
```
loans <- loans_full_schema %>%
 select(loan_amount, interest_rate, term, grade,
 state, annual_income, homeownership, debt_to_income) #select columns loan_amount, interest_rate, term,
glimpse(loans) #see the columns of loans dataset stacked on top of one another
```

```
## Rows: 10,000
## Columns: 8
## $ loan_amount    <int> 28000, 5000, 2000, 21600, 23000, 5000, 24000, 20000, 20~
## $ interest_rate  <dbl> 14.07, 12.61, 17.09, 6.72, 14.07, 6.72, 13.59, 11.99, 1~
## $ term           <dbl> 60, 36, 36, 36, 36, 36, 60, 60, 36, 36, 60, 60, 36, 60,~
## $ grade          <fct> C, C, D, A, C, A, C, B, C, A, C, B, C, B, D, D, D, F, E~
## $ state          <fct> NJ, HI, WI, PA, CA, KY, MI, AZ, NV, IL, IL, FL, SC, CO,~
## $ annual_income  <dbl> 90000, 40000, 40000, 30000, 35000, 34000, 35000, 110000~
## $ homeownership  <fct> MORTGAGE, RENT, RENT, RENT, RENT, OWN, MORTGAGE, MORTGA~
## $ debt_to_income <dbl> 18.01, 5.04, 21.15, 10.16, 57.96, 6.46, 23.66, 16.19, 3~
```

Histogram

```
ggplot(loans) + aes(x = loan_amount) +
 geom_histogram()
```

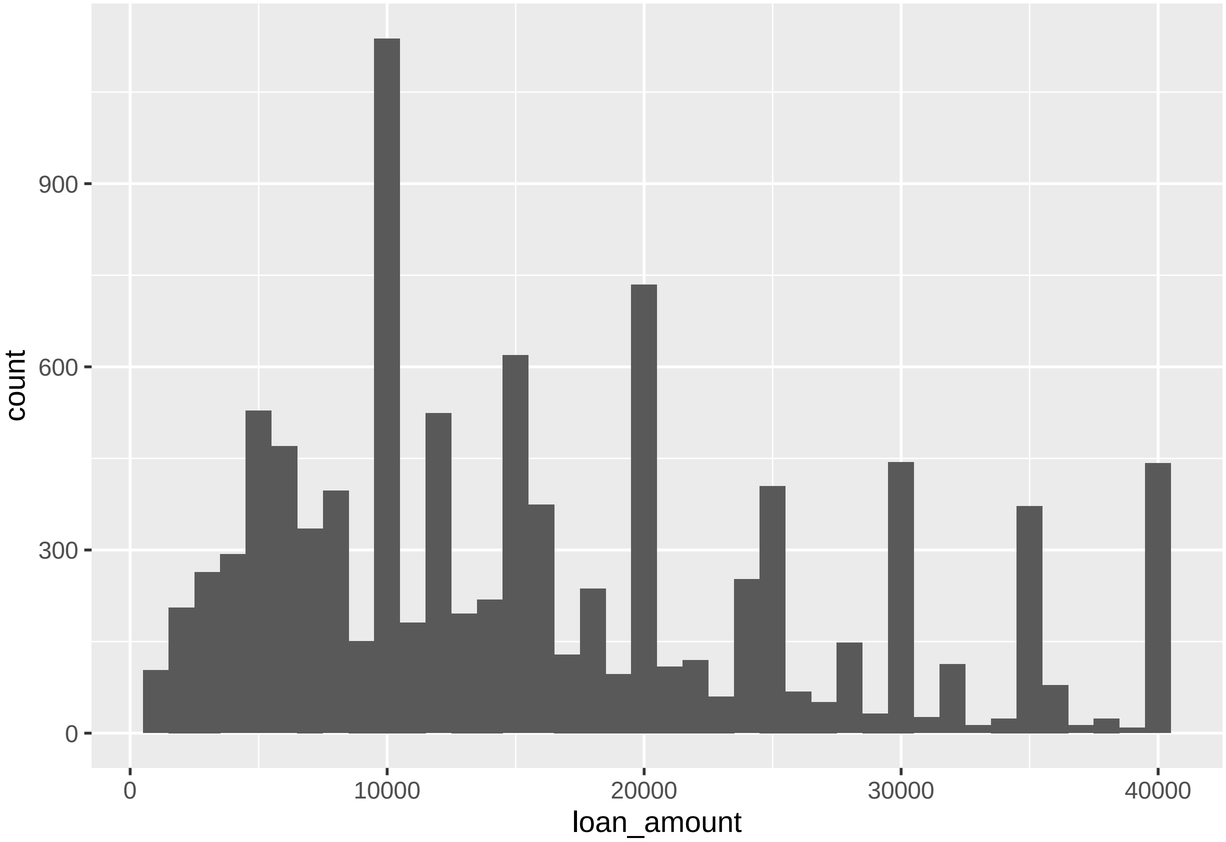
```
## ‘stat_bin()‘ using ‘bins = 30‘. Pick better value with ‘binwidth‘.
```



```
# plot a histogram of loan amount
```

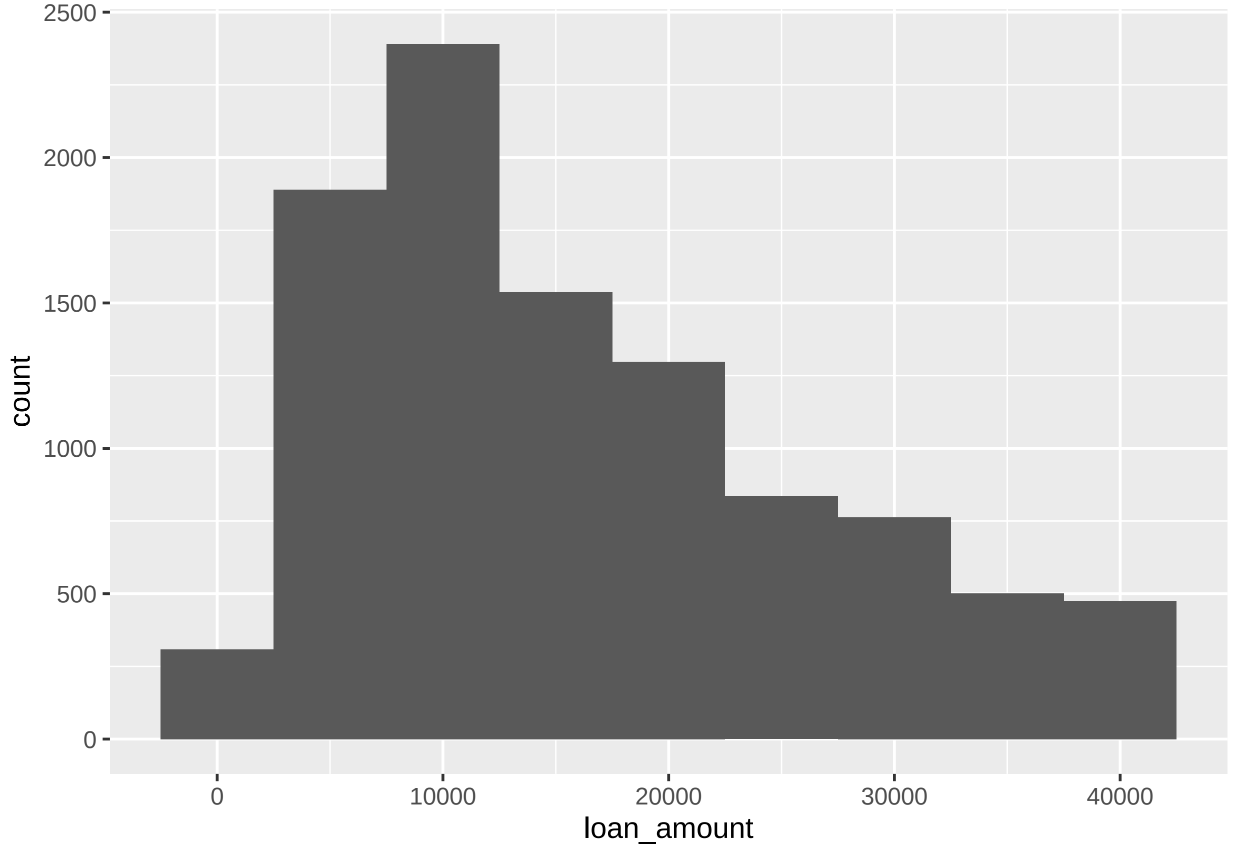
Set Binwidth to 1000

```
# binwidth = 1000
ggplot(loans, aes(x = loan_amount)) +
 geom_histogram(binwidth = 1000) #set bidwidth to 1000
```



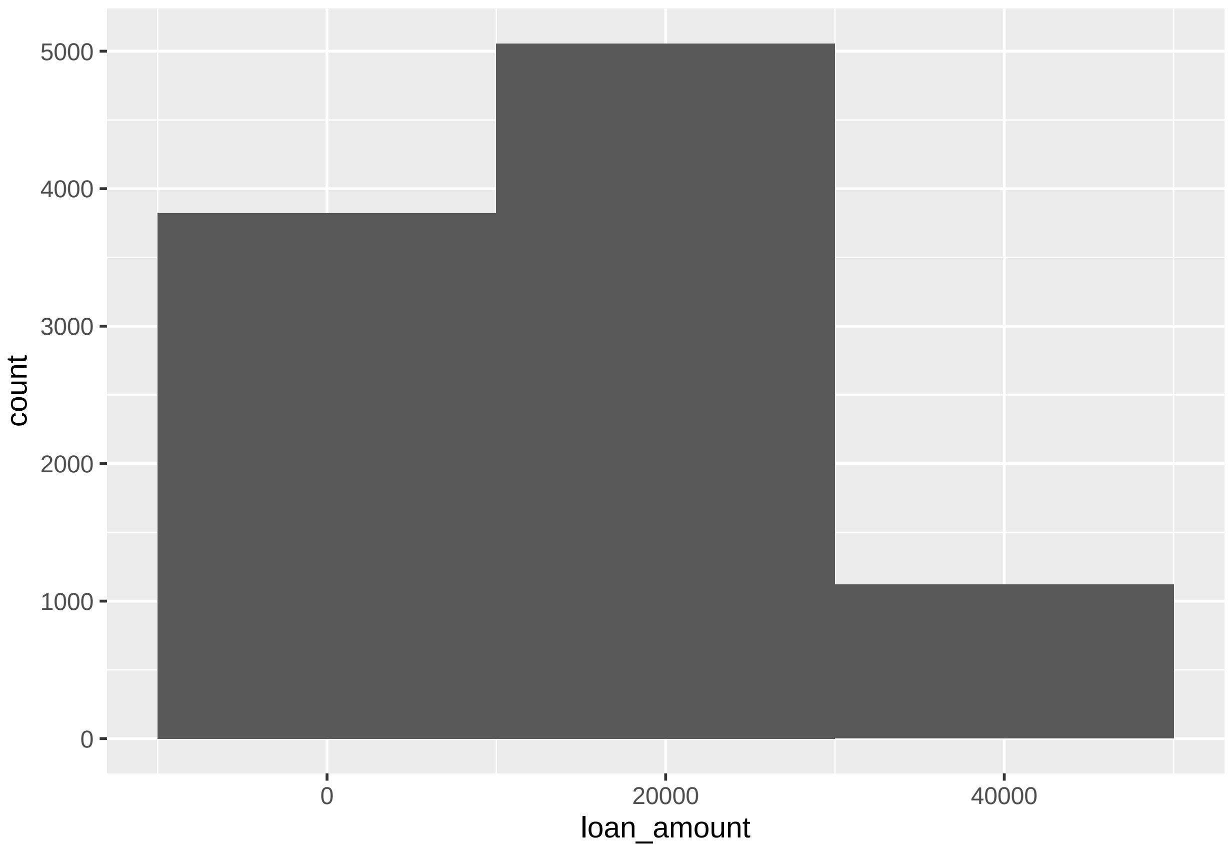
Set Binwidth to 5000

```
ggplot(loans, aes(x = loan_amount)) +
 geom_histogram(binwidth = 5000) #set bidwidth to 5000
```



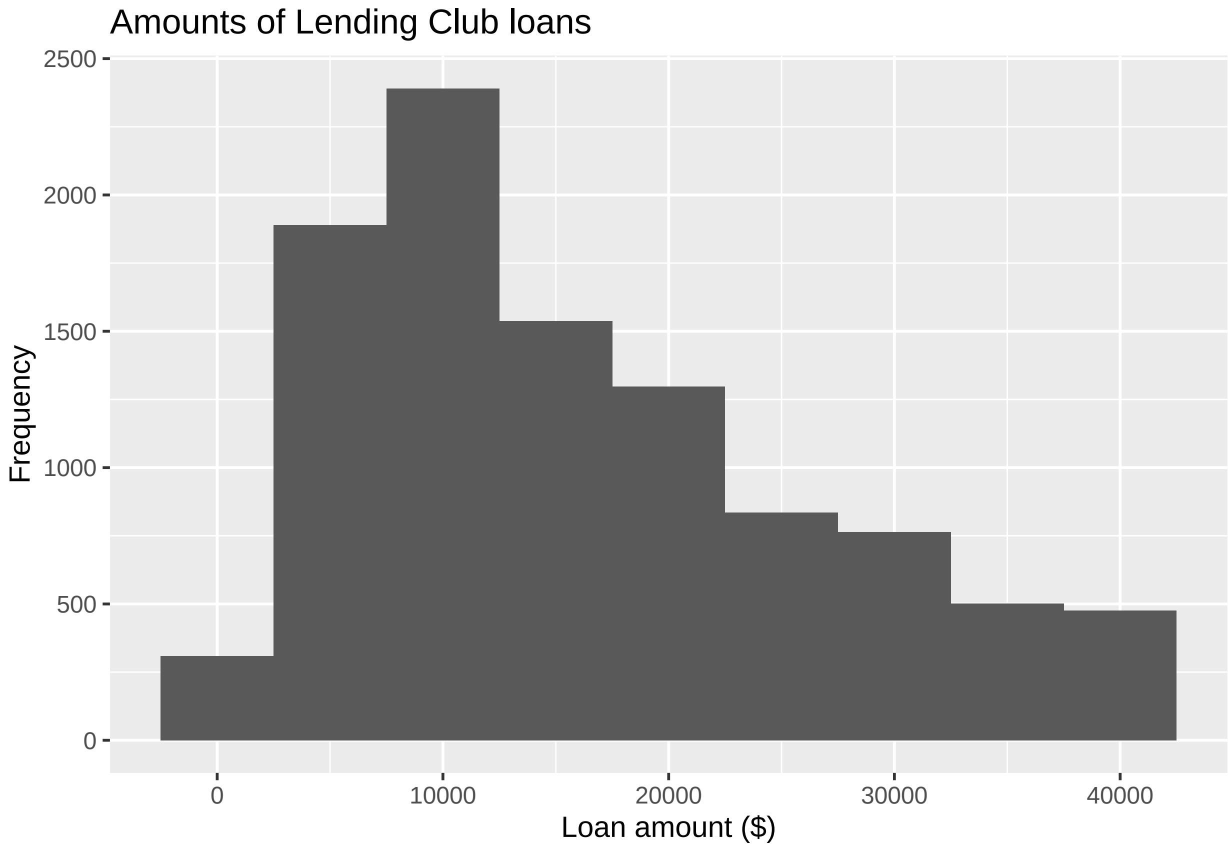
Set Binwidth to 20000

```
ggplot(loans, aes(x = loan_amount)) +
 geom_histogram(binwidth = 20000) #set bidwidth to 20000
```



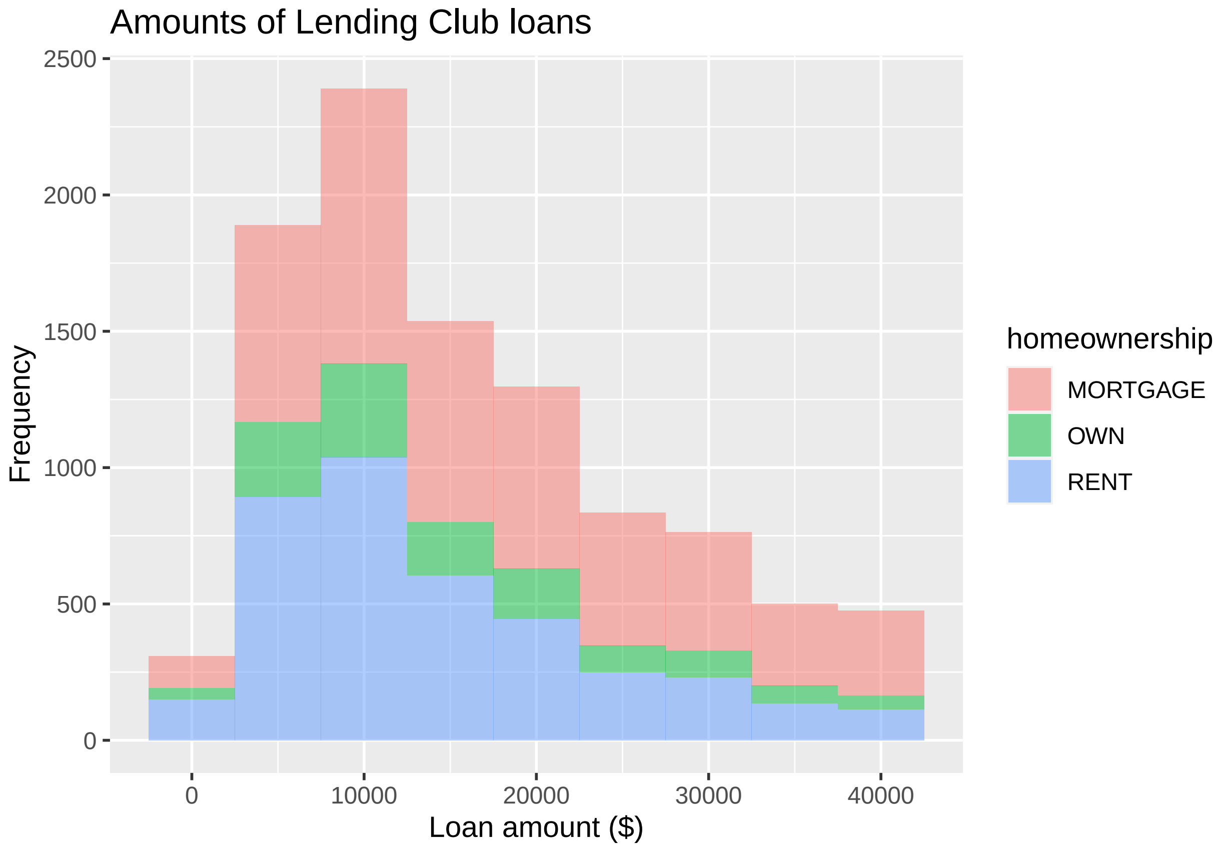
Customising Histograms

```r
ggplot(loans, aes(x = loan_amount)) + geom_histogram(binwidth = 5000) +
 labs(x = "Loan amount ($)", y = "Frequency", title = "Amounts of Lending Club loans") #label x axis as
```



Fill with a categorical variable

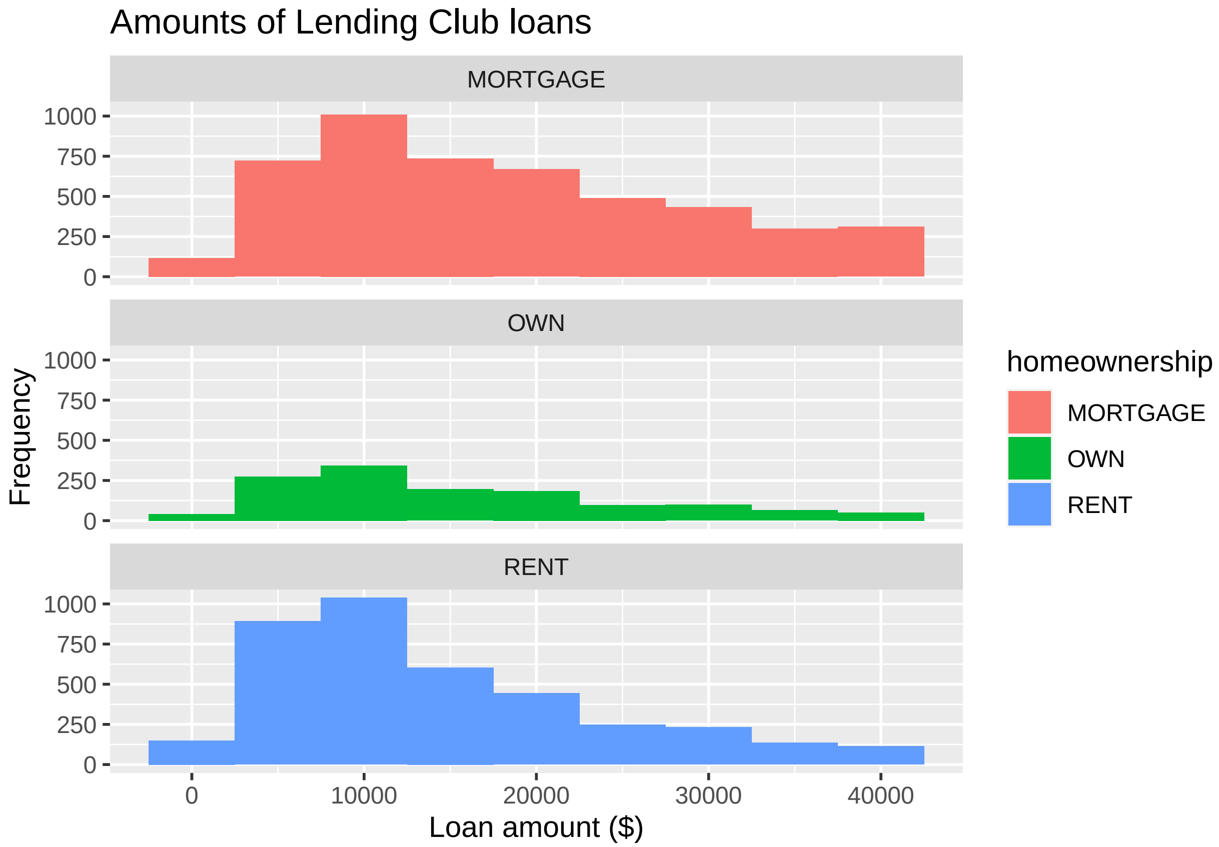
```
ggplot(loans, aes(x = loan_amount, fill = homeownership)) + geom_histogram(binwidth = 5000, alpha = 0.5
 labs(x = "Loan amount ($)",y = "Frequency",title = "Amounts of Lending Club loans")
```



```
#split ownership by colour
```

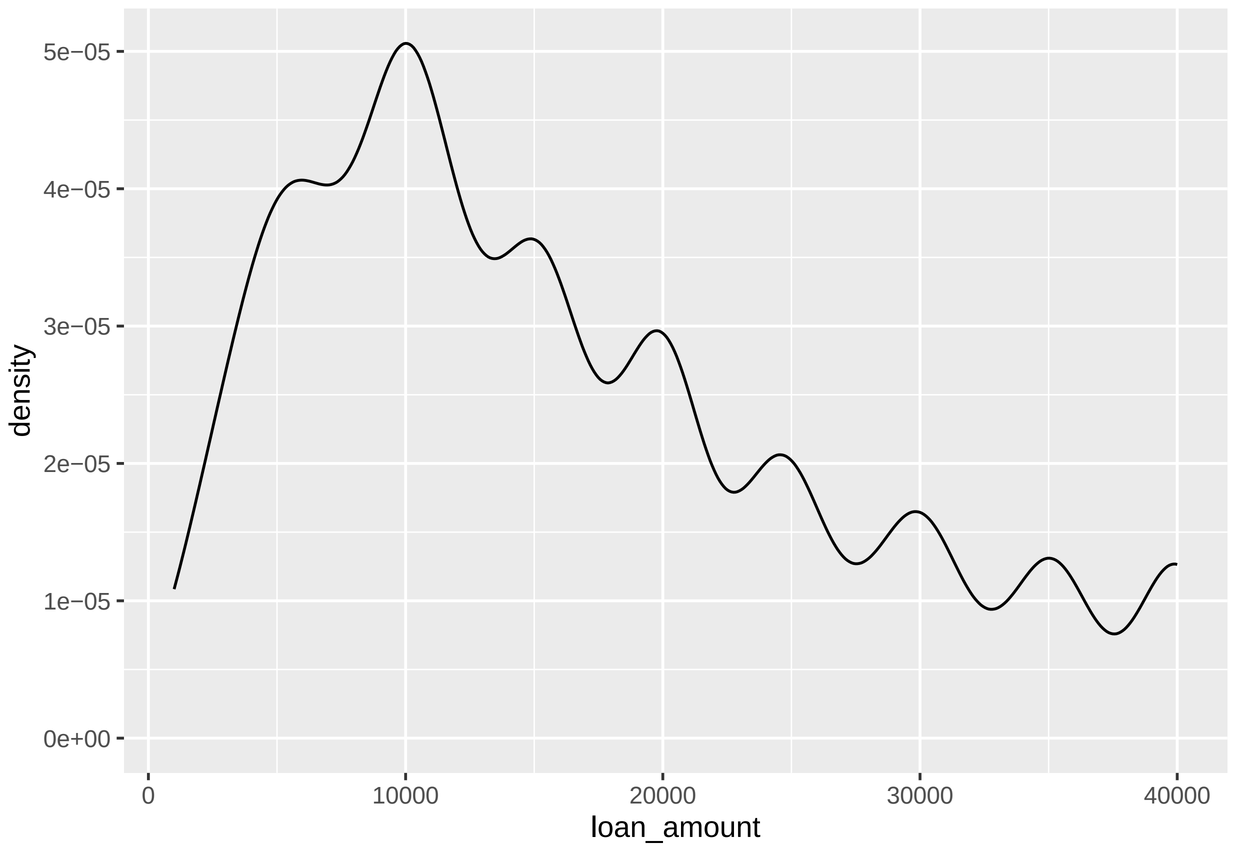
Facet with a categorical variable

```
ggplot(loans, aes(x = loan_amount, fill = homeownership)) + geom_histogram(binwidth = 5000) +
 labs(x = "Loan amount ($)",y = "Frequency",title = "Amounts of Lending Club loans") +
 facet_wrap(~ homeownership, nrow = 3) #plot each type of ownership
```



Density plot

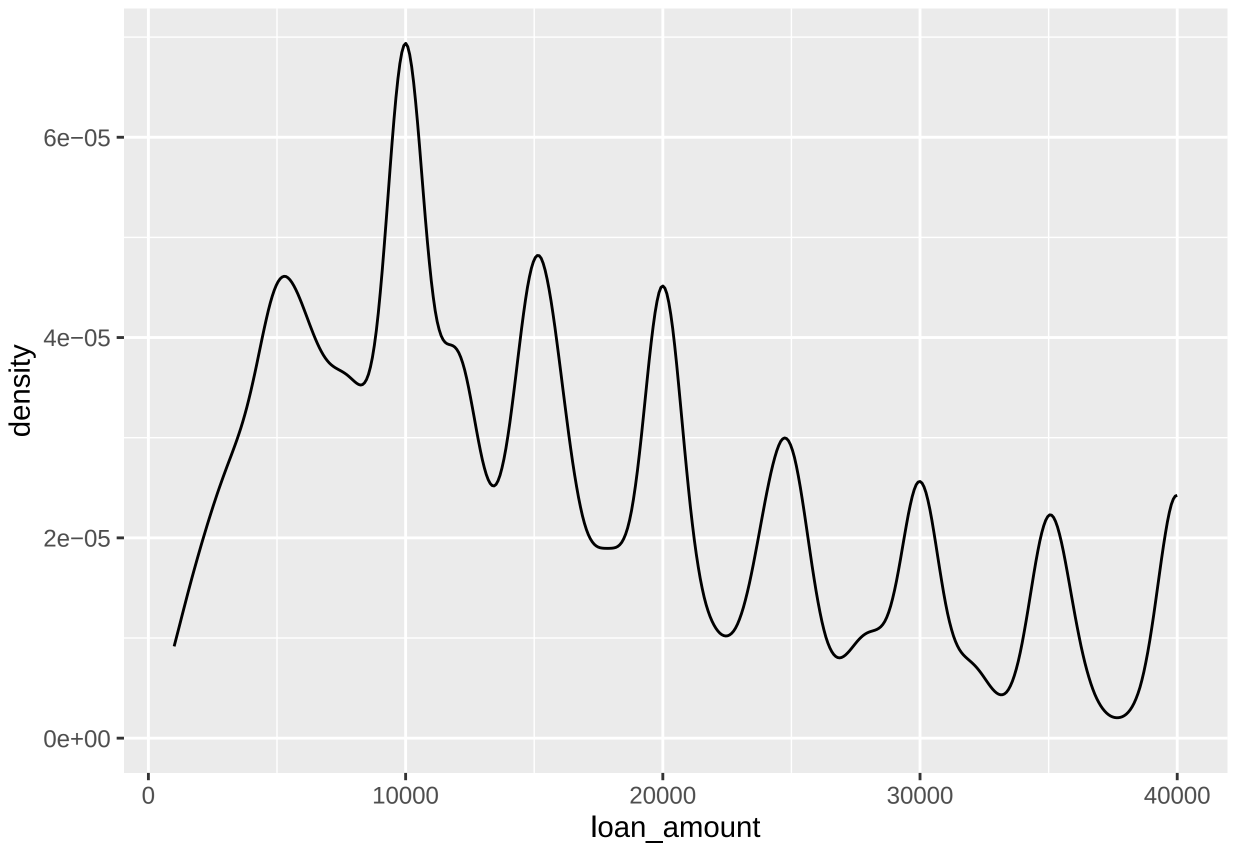
```
ggplot(loans, aes(x = loan_amount)) +
 geom_density() #plot a density plot
```



Density plots and adjusting bandwidth

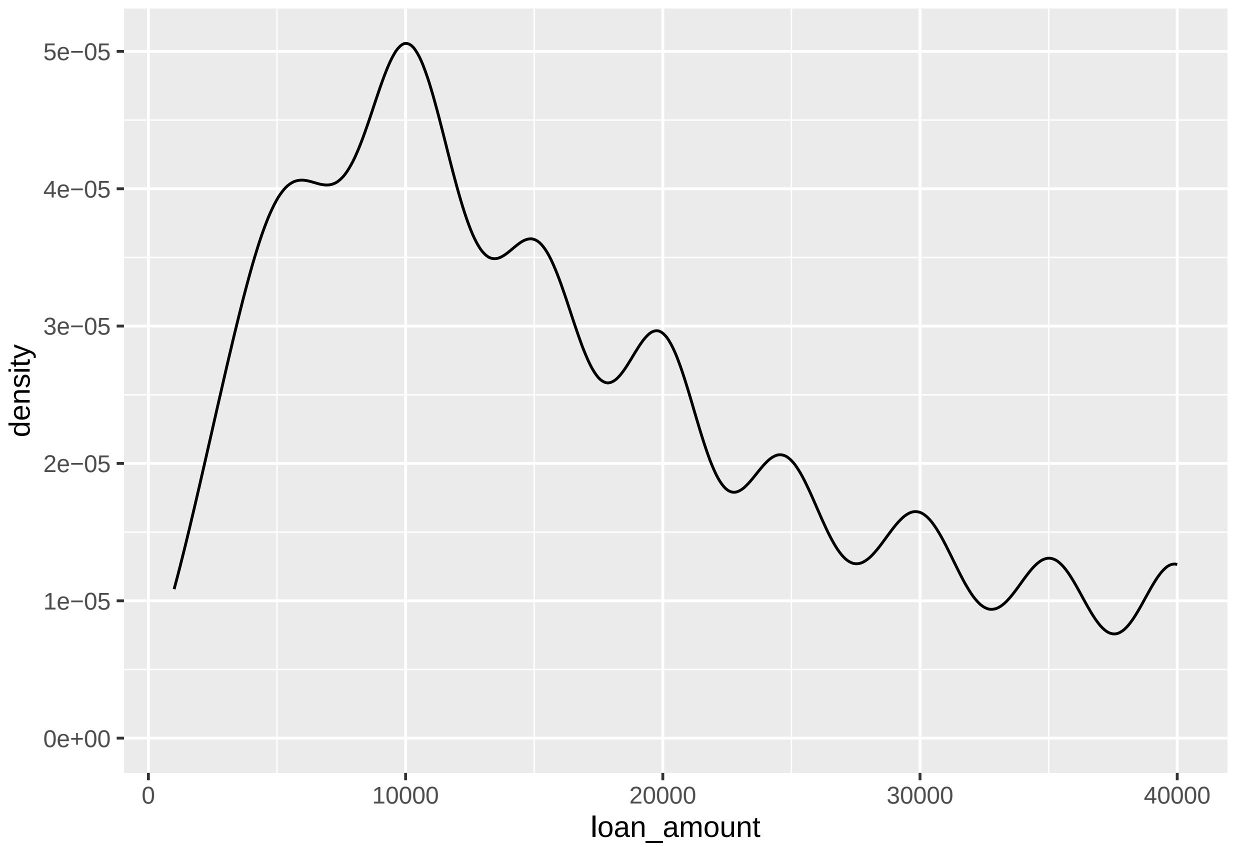
Adjust to 0.5

```
ggplot(loans, aes(x = loan_amount)) +
 geom_density(adjust = 0.5) #adjust bandwidth to 0.5
```



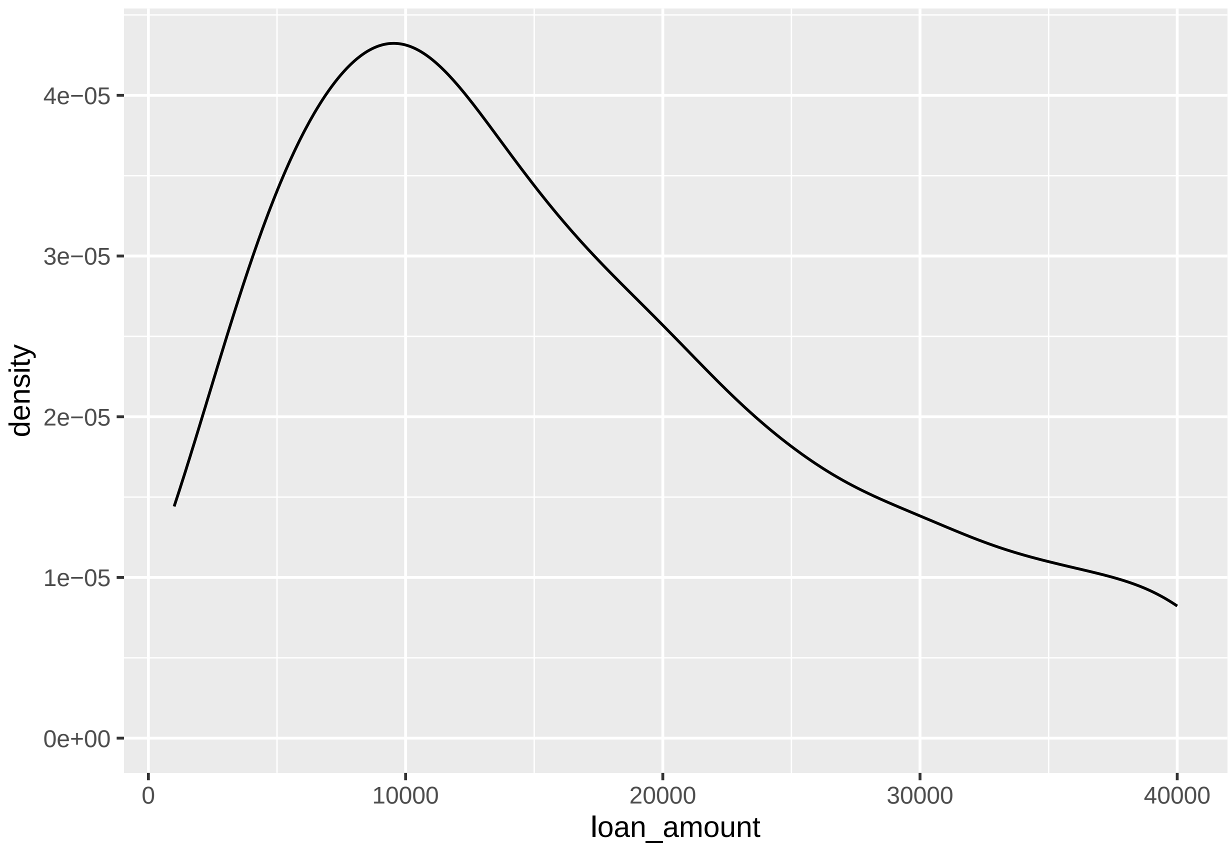
Adjust to 1

```
ggplot(loans, aes(x = loan_amount)) +
 geom_density(adjust = 1) # default bandwidth
```



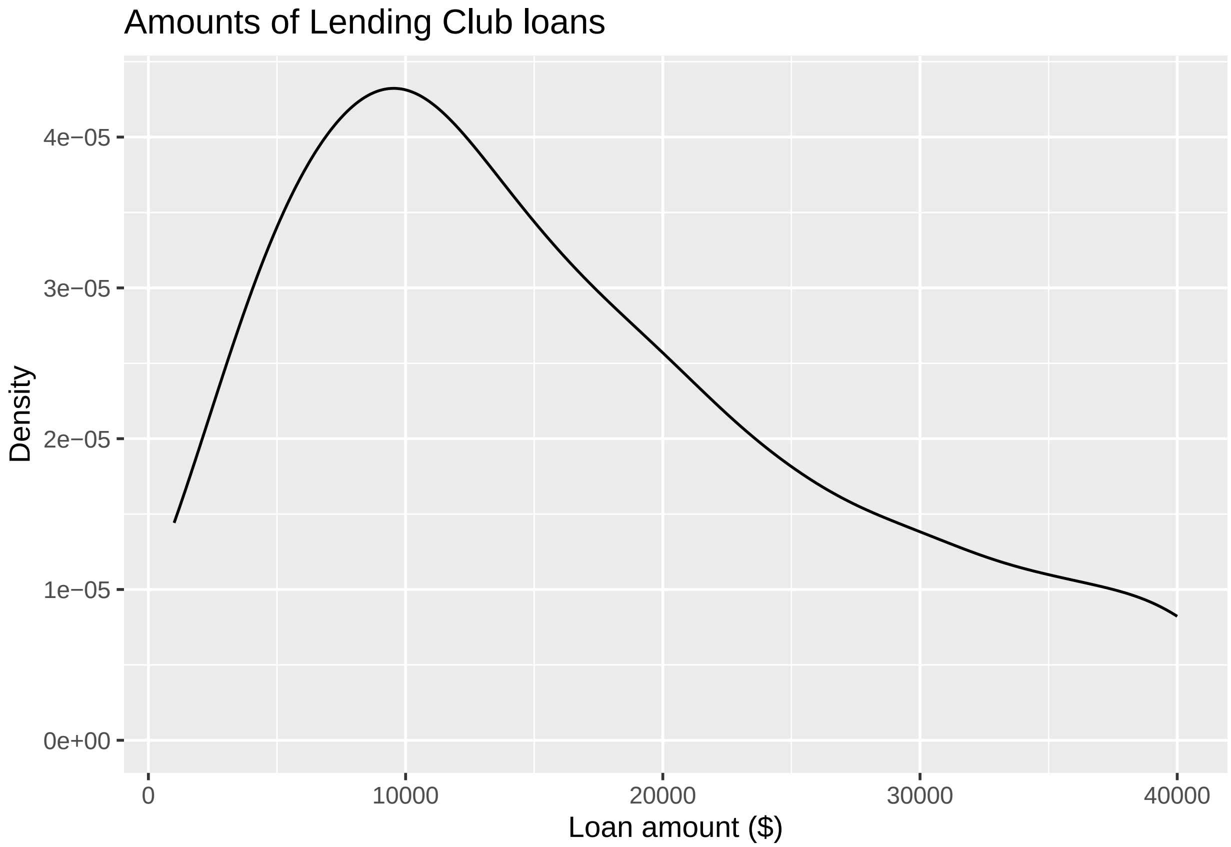
Adjust to 2

```
ggplot(loans, aes(x = loan_amount)) +
 geom_density(adjust = 2) #adjust bandwidth to 2
```



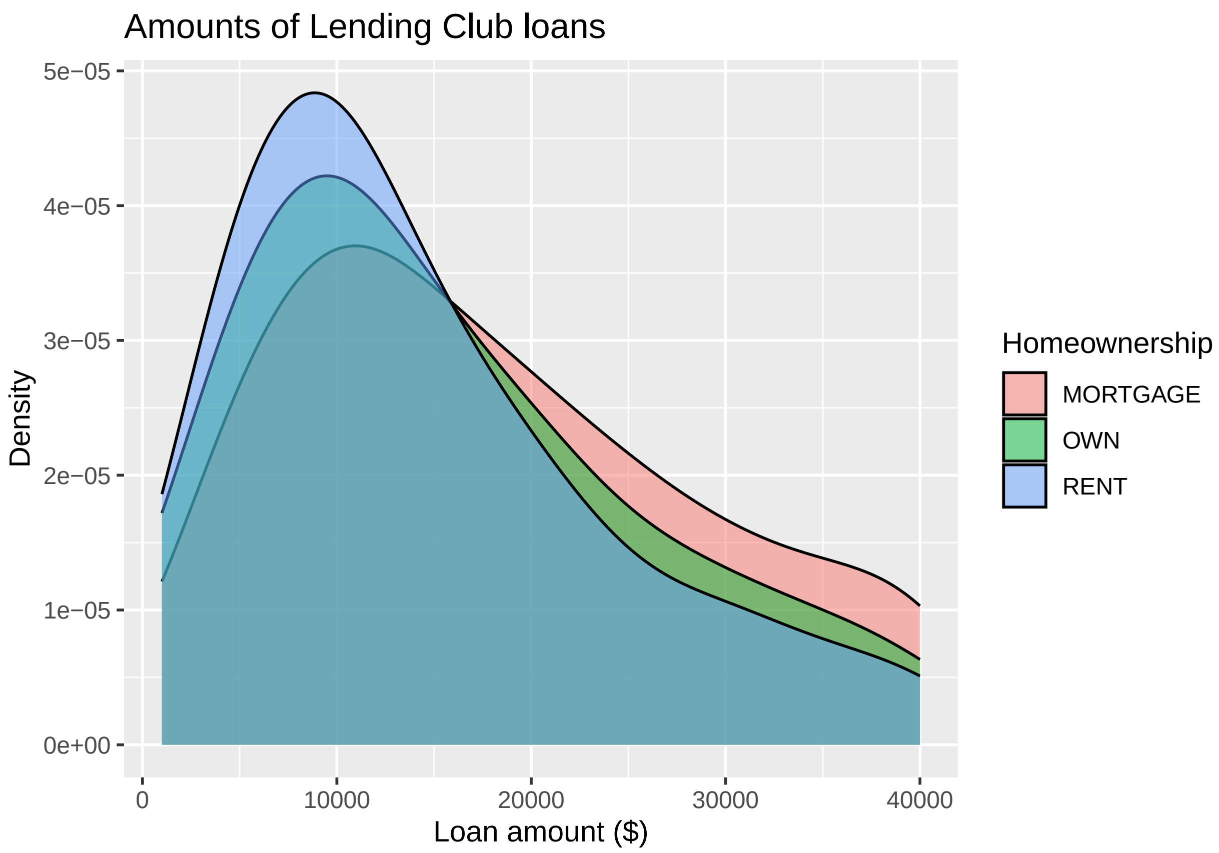
Customising density plots

```
ggplot(loans, aes(x = loan_amount)) +
 geom_density(adjust = 2) +
 labs( x = "Loan amount ($)", y = "Density", title = "Amounts of Lending Club loans" ) #
```



Adding a categorical variable

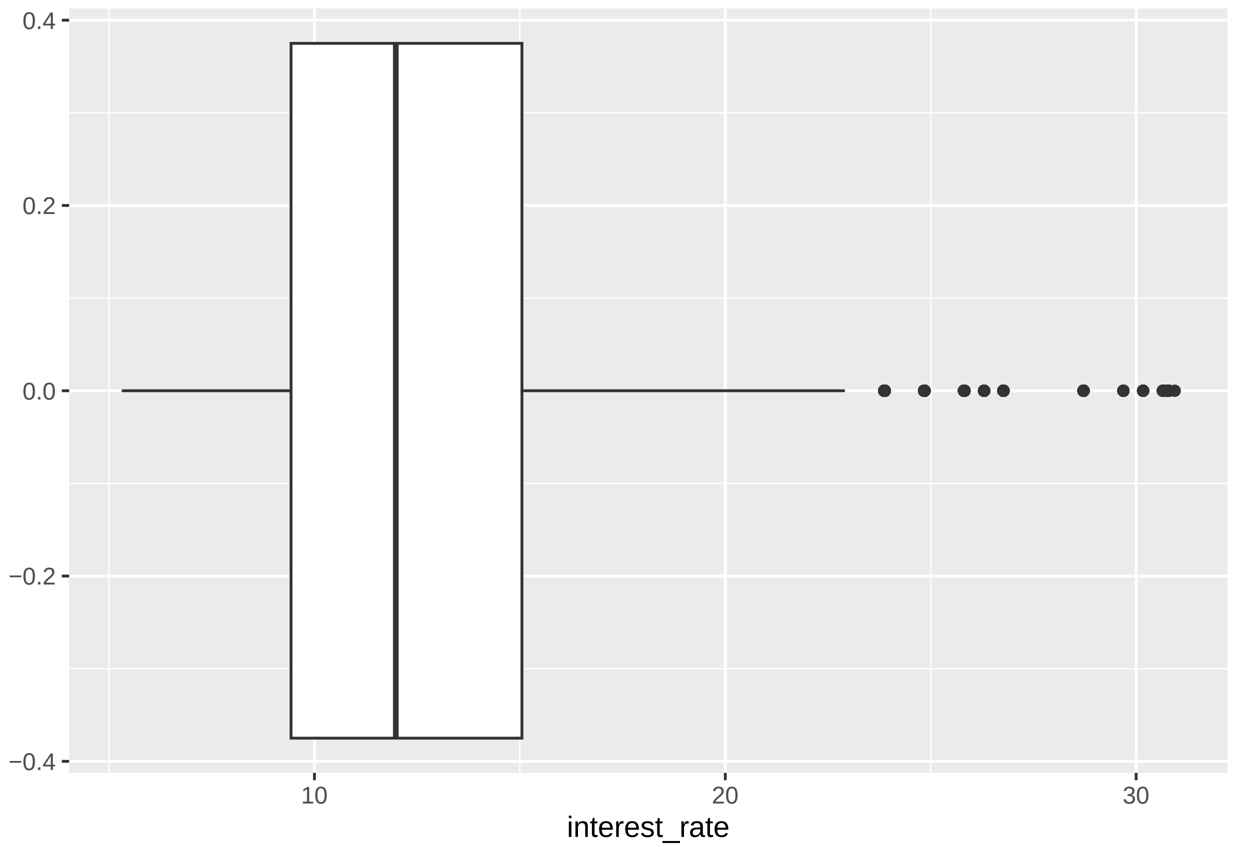
```
ggplot(loans, aes(x = loan_amount, fill = homeownership)) +
 geom_density(adjust = 2, alpha = 0.5) +
 labs(x = "Loan amount ($)",y = "Density",title = "Amounts of Lending Club loans", fill = "Homeownershi
```



#Box Plot

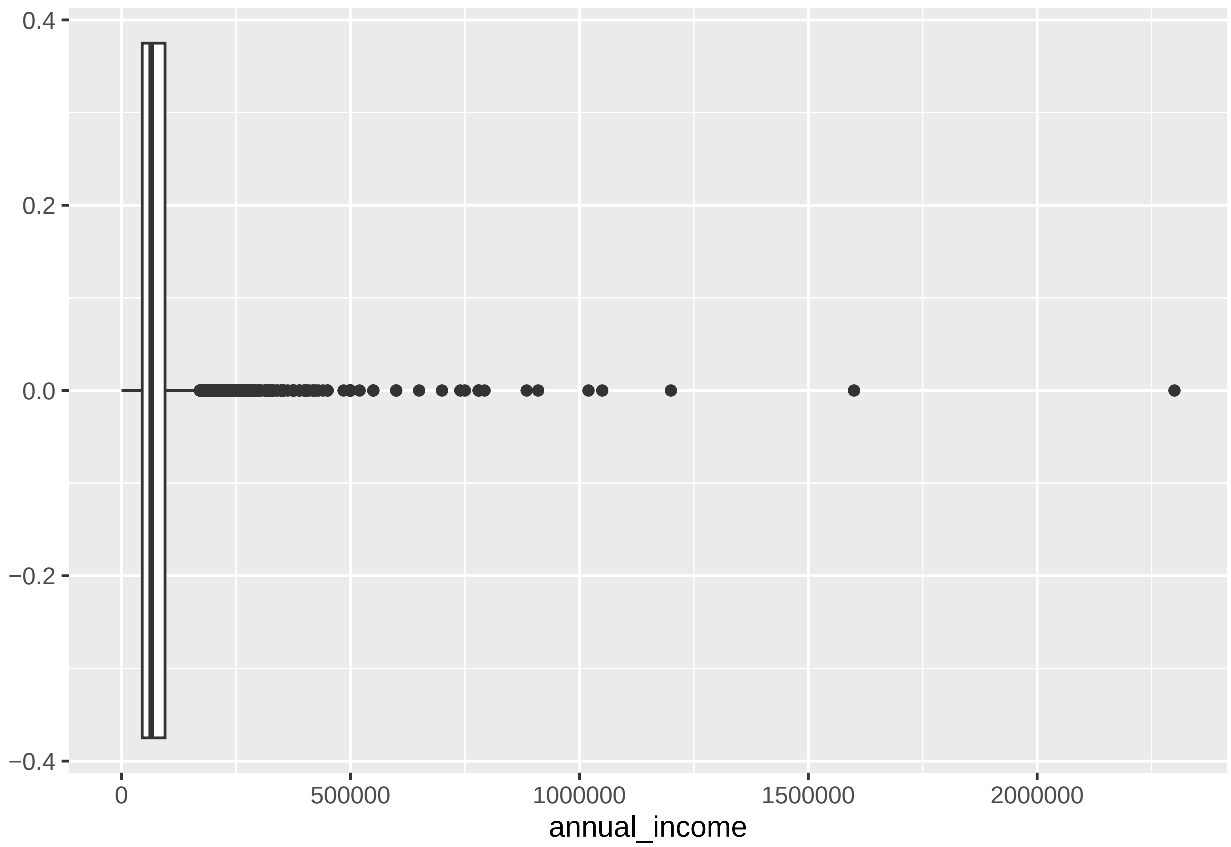
Box Plot of Interest Rate

```
ggplot(loans, aes(x = interest_rate)) +
 geom_boxplot() #plot a boxplot of interest rate
```



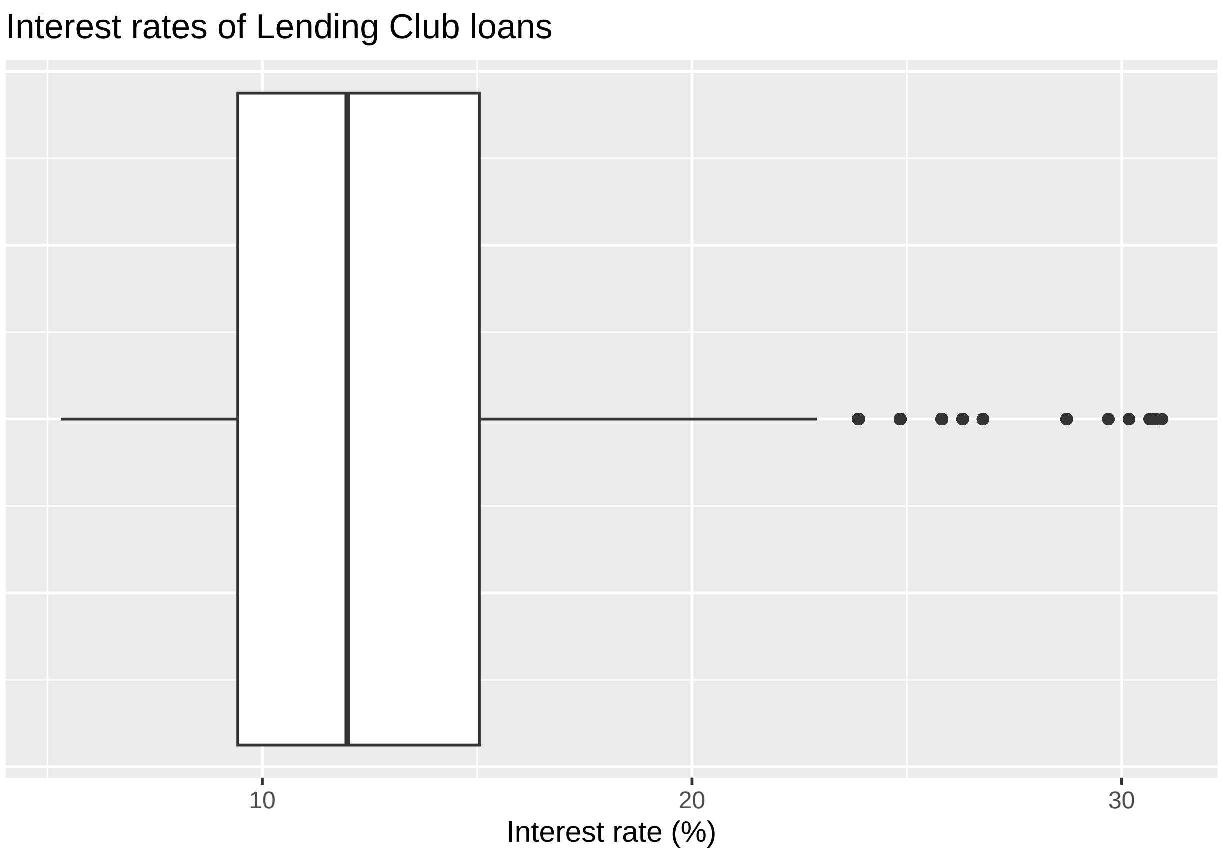
Box Plot of Annual Income

```
ggplot(loans, aes(x = annual_income)) +
 geom_boxplot() #plot a boxplot of annual income
```



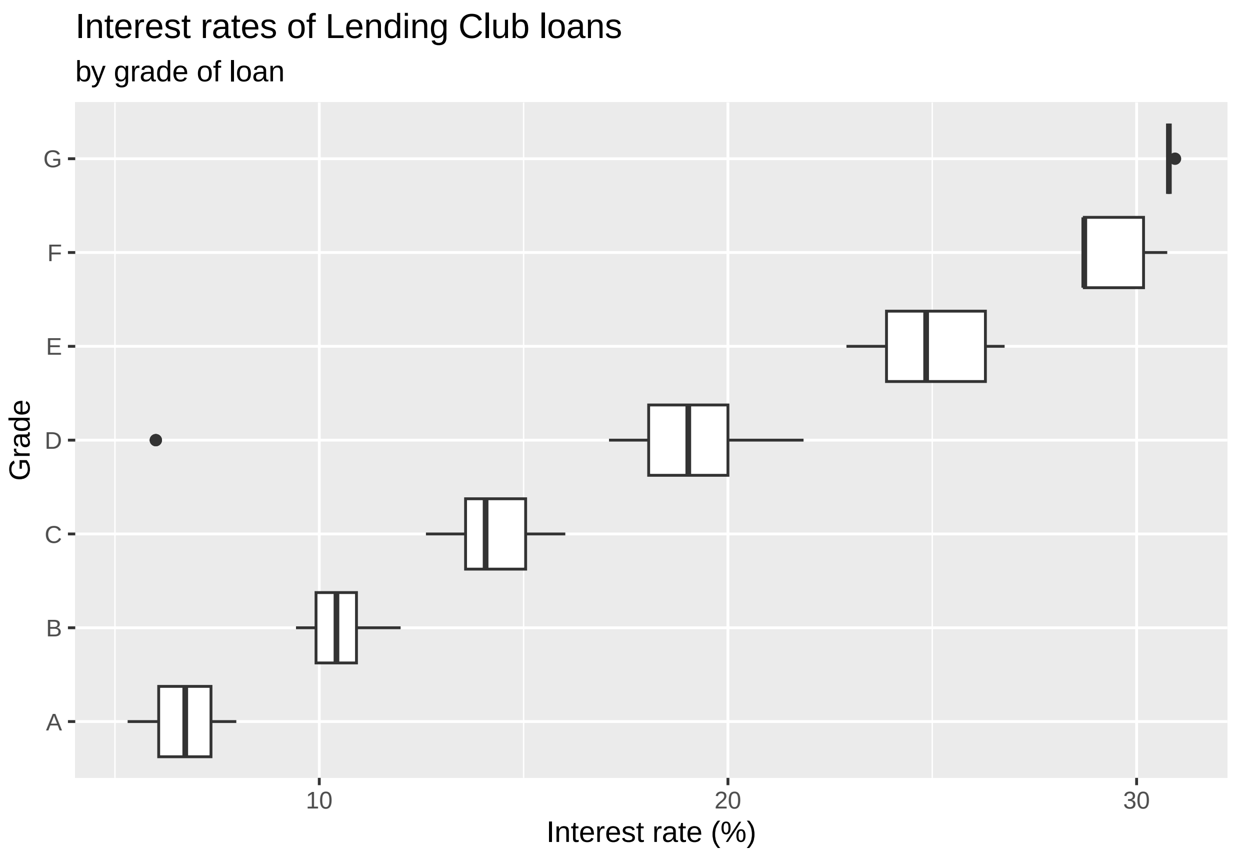
#Customising Box Plots

```
ggplot(loans, aes(x = interest_rate)) +geom_boxplot() +labs(x = "Interest rate (%)",y = NULL,
 title = "Interest rates of Lending Club loans") +
 theme( axis.ticks.y = element_blank(), axis.text.y = element_blank() ) #decrease the tick marks of the
```



#Adding a categoric variable

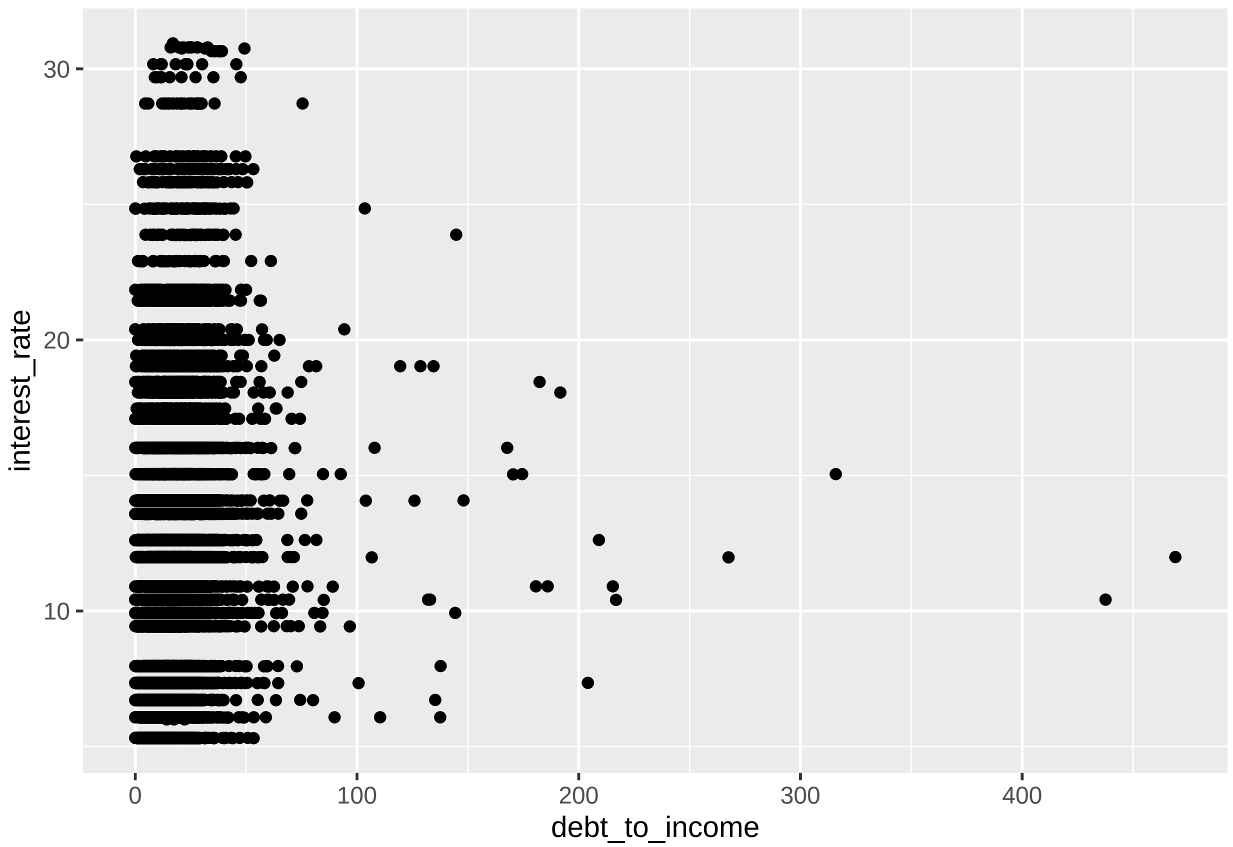
```
 #add a categorical variable grade and plot it as the yaxis
ggplot(loans, aes(x = interest_rate,
 y = grade)) + geom_boxplot() +
 labs(x = "Interest rate (%)",y = "Grade",title = "Interest rates of Lending Club loans",subtitle="by g
```



Scatterplot

```
ggplot(loans, aes(x = debt_to_income, y = interest_rate)) +
 geom_point()#plot a scatterplot
```

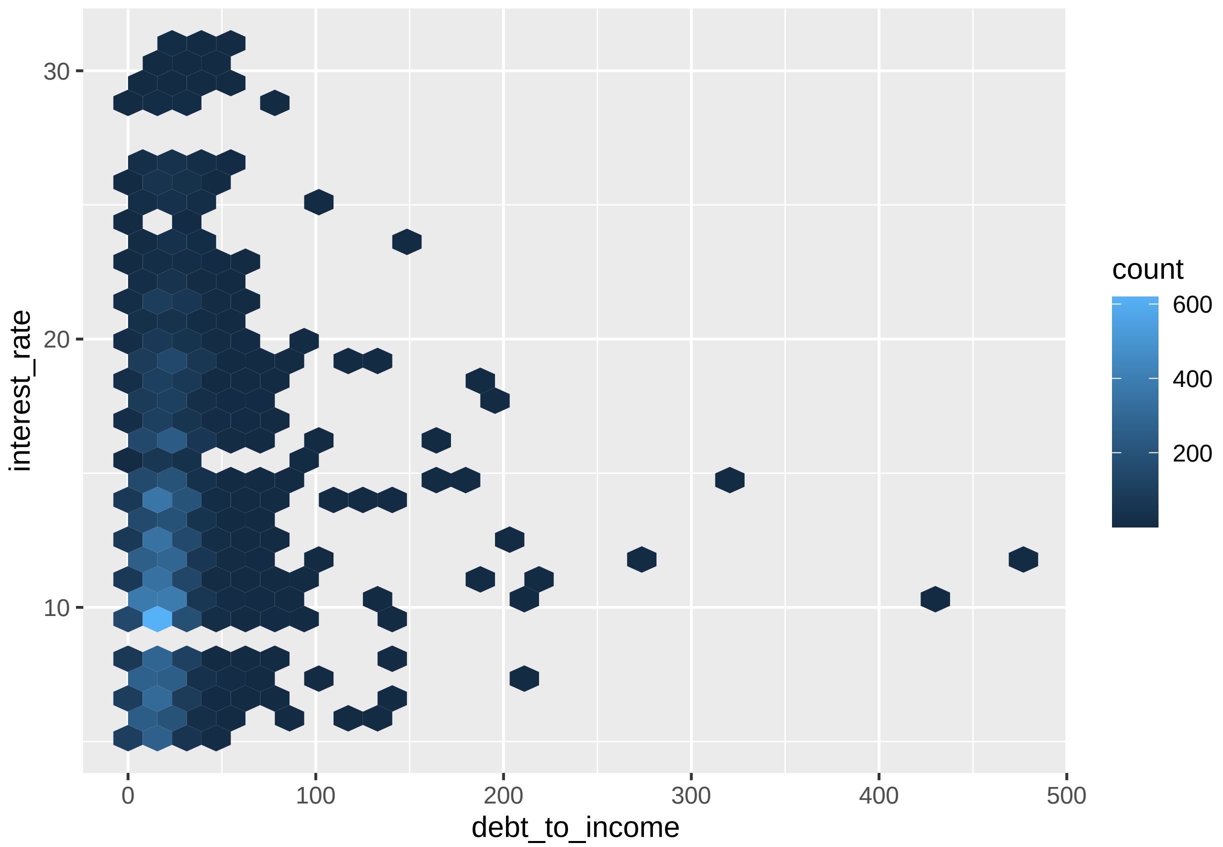
```
## Warning: Removed 24 rows containing missing values (‘geom_point()‘).
```



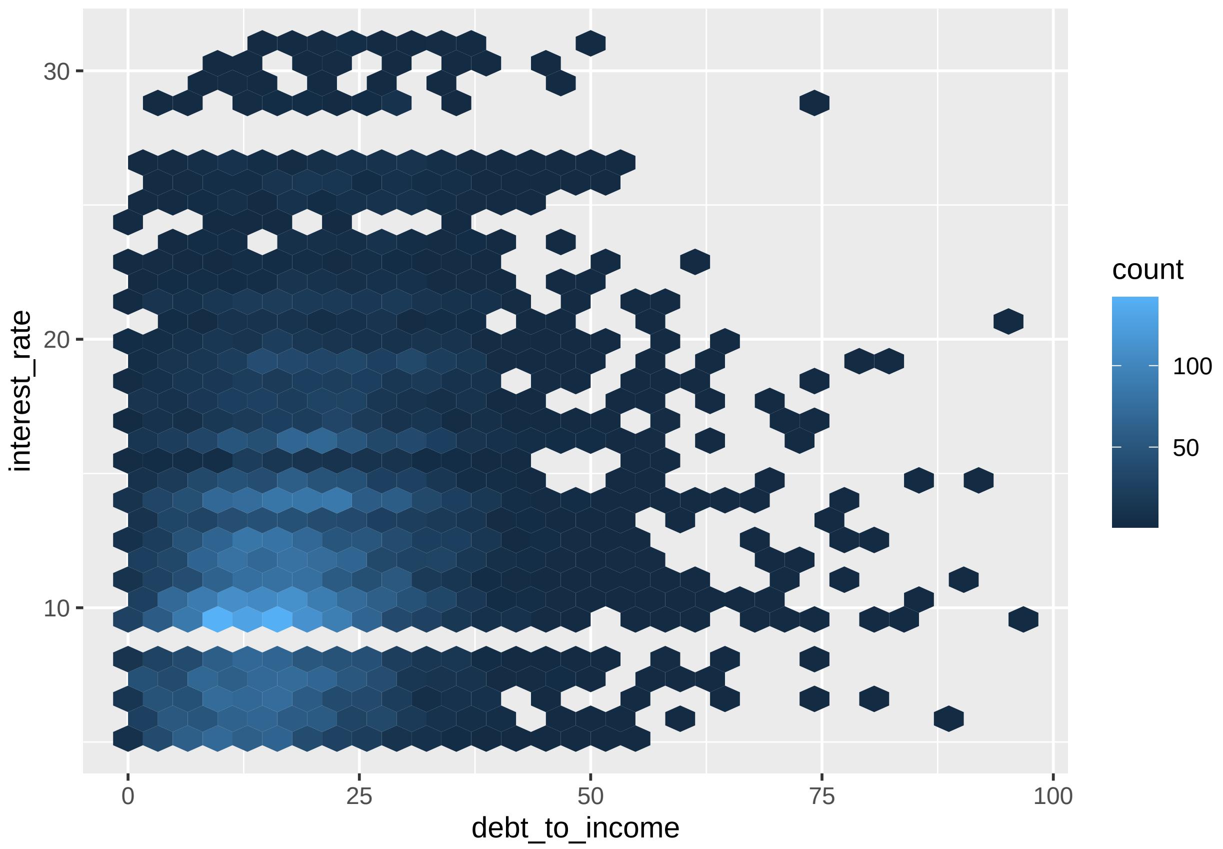
#Hex Plot

```
ggplot(loans, aes(x = debt_to_income, y = interest_rate)) +
 geom_hex() #plot a hex plot
```

```
## Warning: Removed 24 rows containing non-finite values (‘stat_binhex()‘).
```

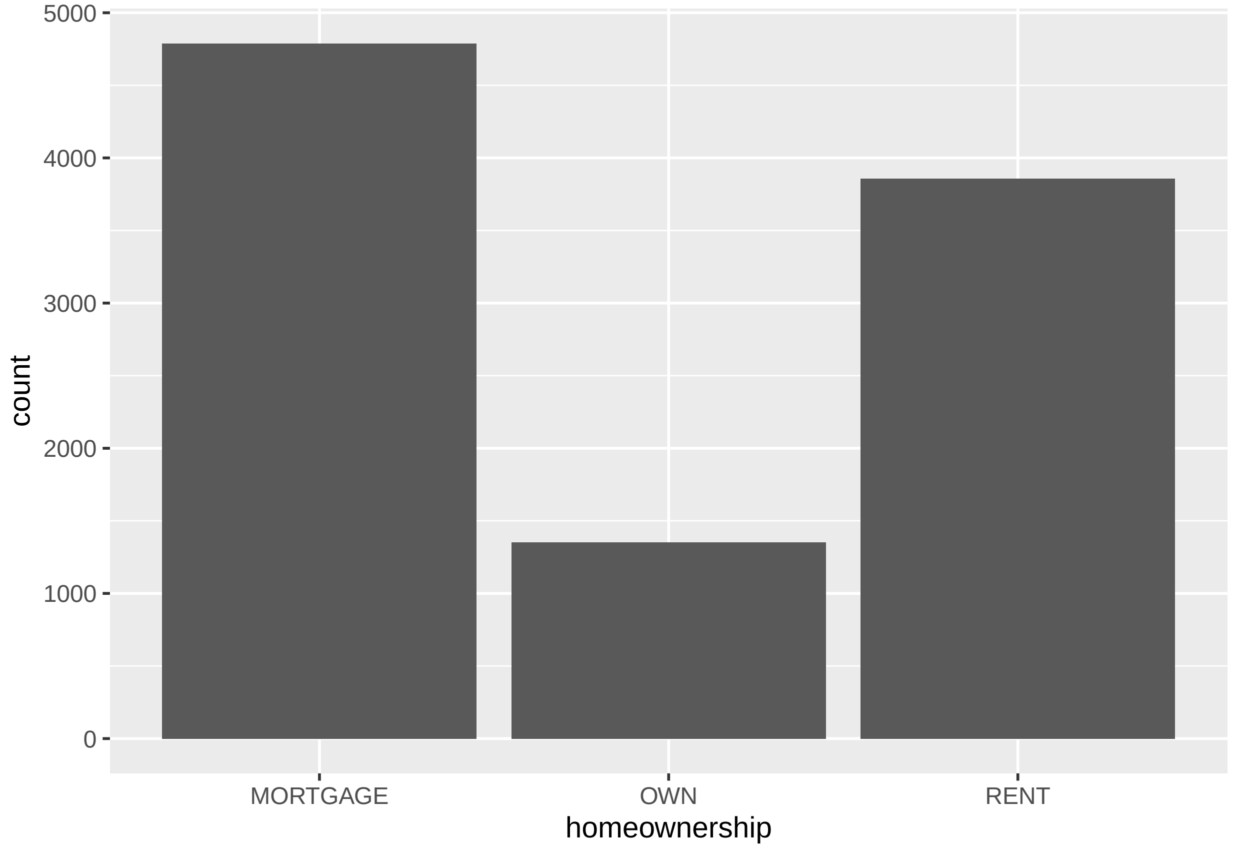


```
ggplot(loans %>% filter(debt_to_income < 100),
 aes(x = debt_to_income, y = interest_rate)) +
 geom_hex() #plot a hex plot for debt_to_income < 100
```



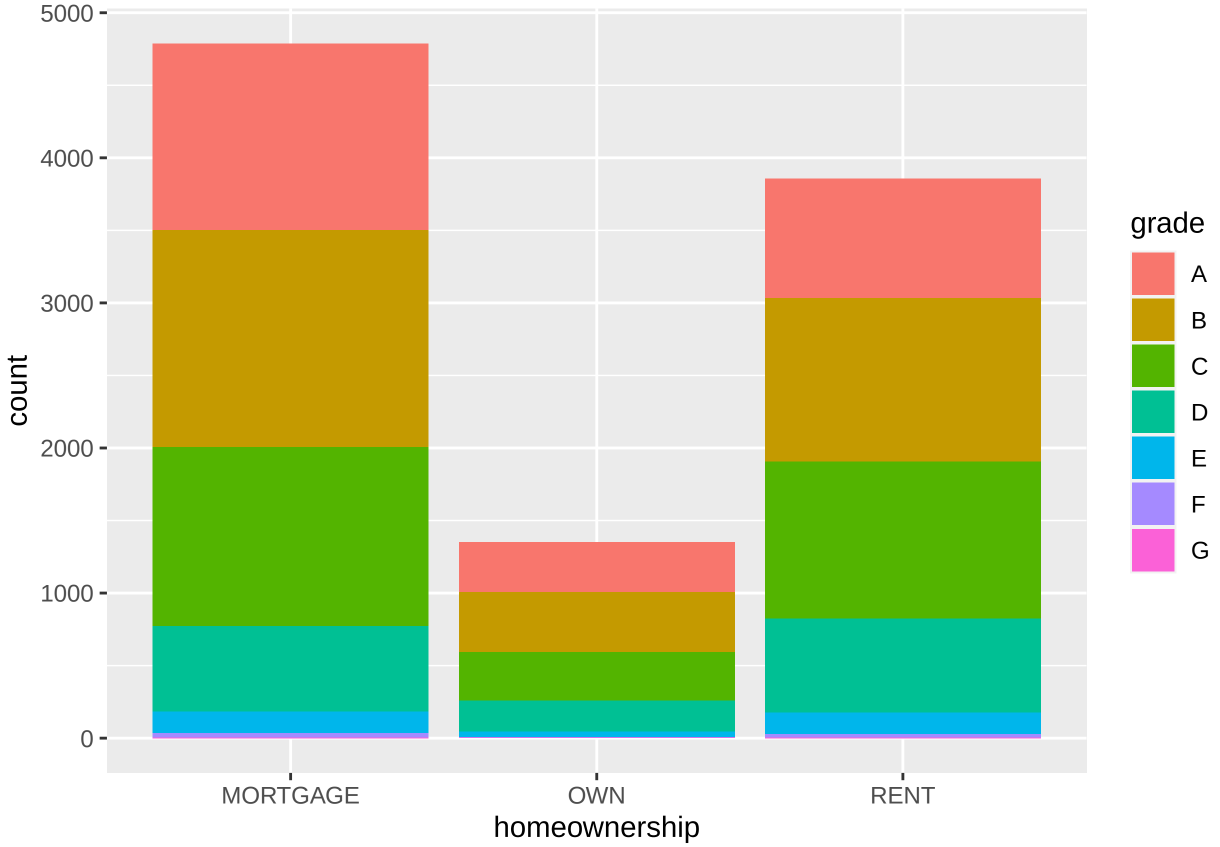
Bar Plot

```
ggplot(loans, aes(x = homeownership)) +
 geom_bar() #plot a bar plot
```

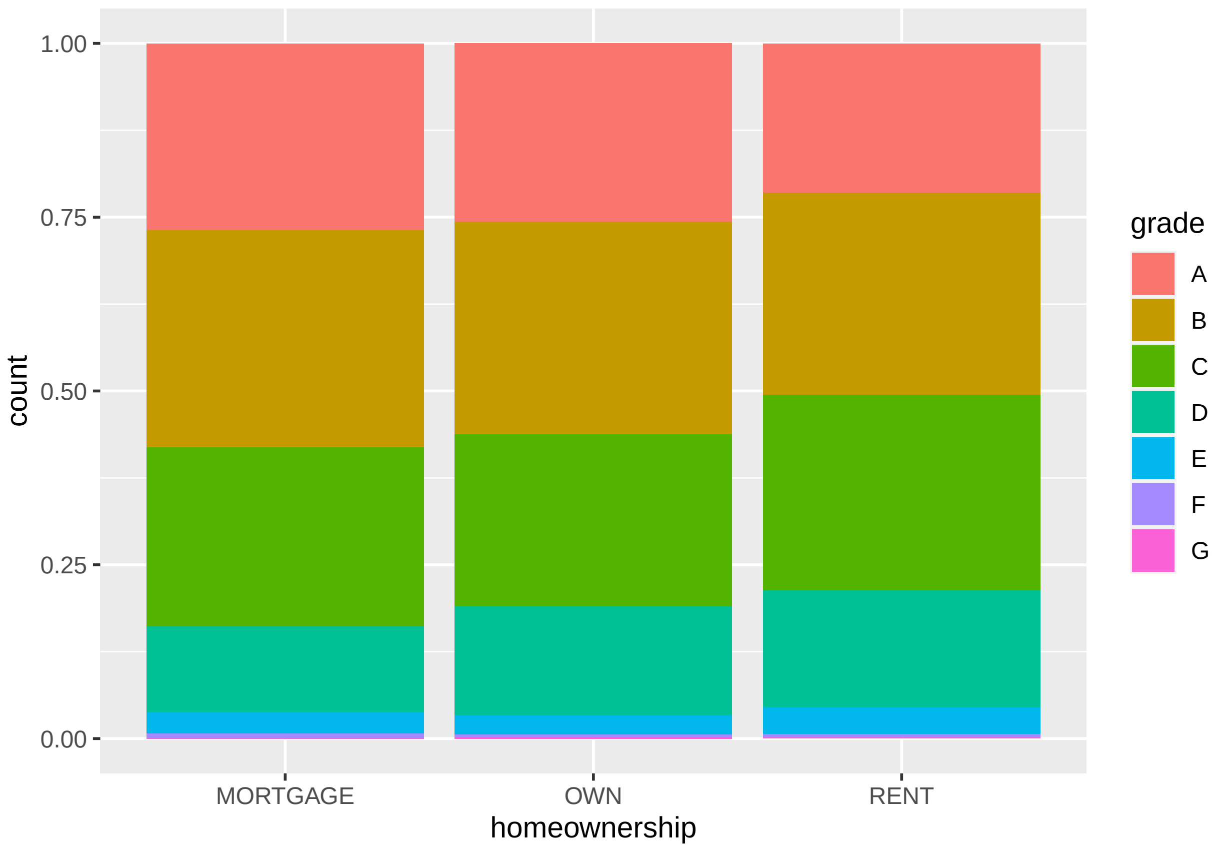


Segmented Bar Plot

```
ggplot(loans, aes(x = homeownership,
 fill = grade)) + geom_bar() #split each grade by colour
```

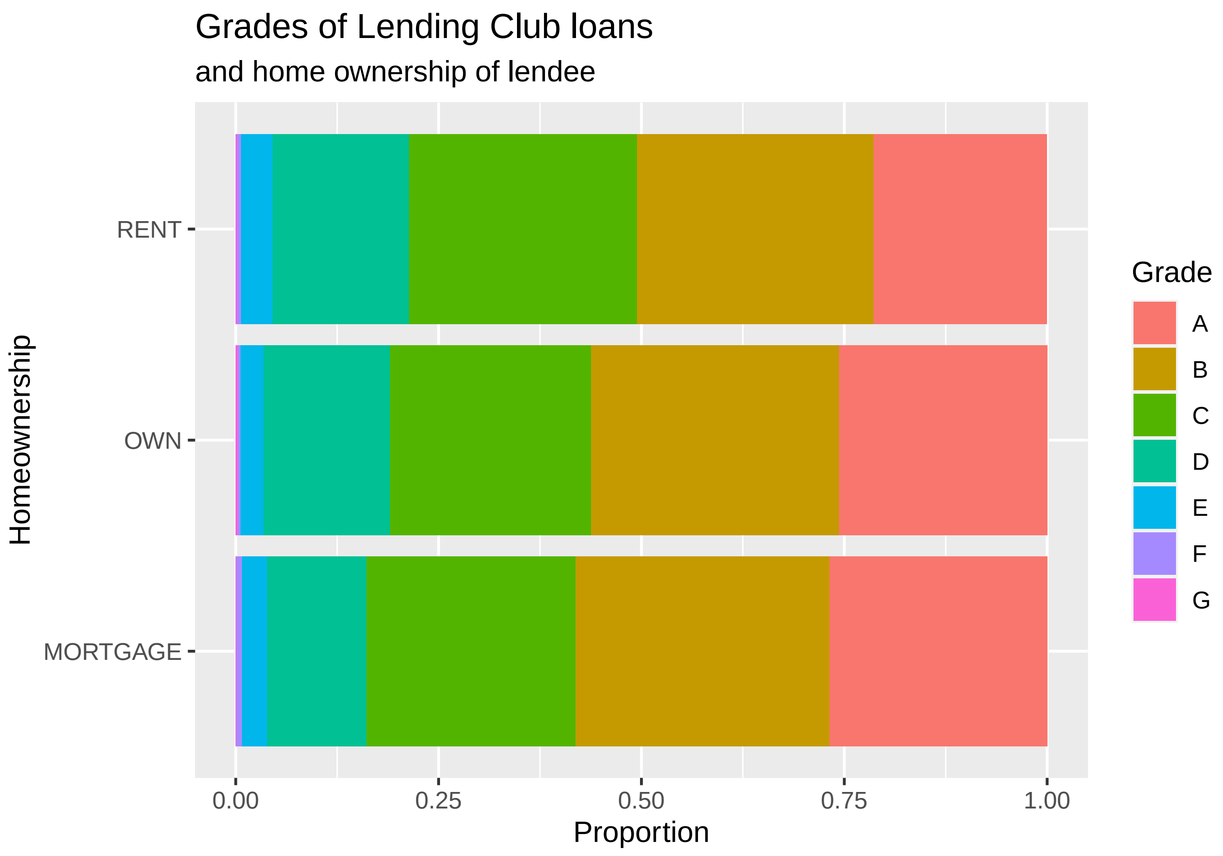


```
ggplot(loans, aes(x = homeownership, fill = grade)) +
 geom_bar(position = "fill") #make all the bars the same height so compare the proportion of the grade
```



Customising Bar Plots

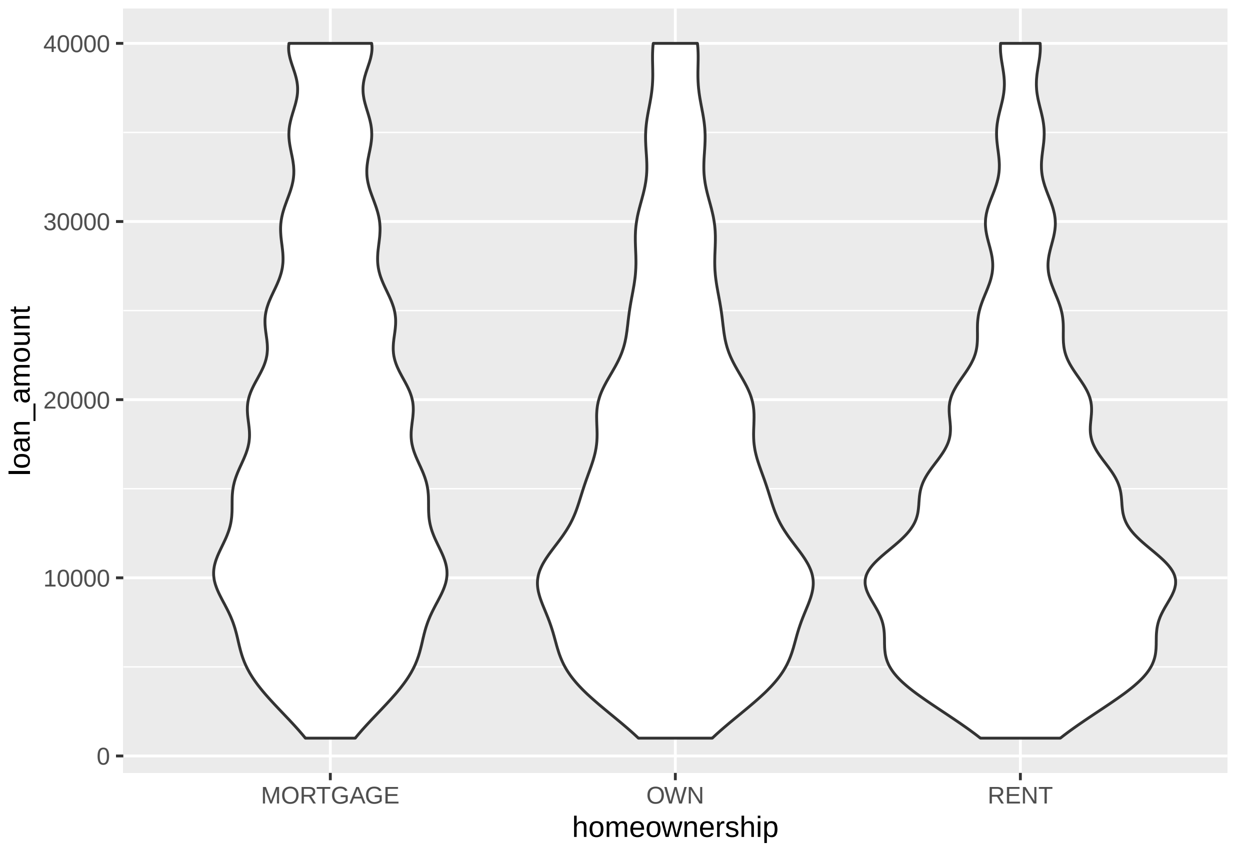
```
#plot a histogram wih homeownership on the y axis
ggplot(loans, aes(y = homeownership, fill = grade)) + geom_bar(position = "fill") +
labs( x = "Proportion", y = "Homeownership", fill = "Grade", title = "Grades of Lending Club loans", sub
```



```
#label x and y axis, add title, add subtitle, split each grade by colour
```

Violin Plots

```
ggplot(loans, aes(x = homeownership, y = loan_amount)) +
 geom_violin() #plot a violin plot
```



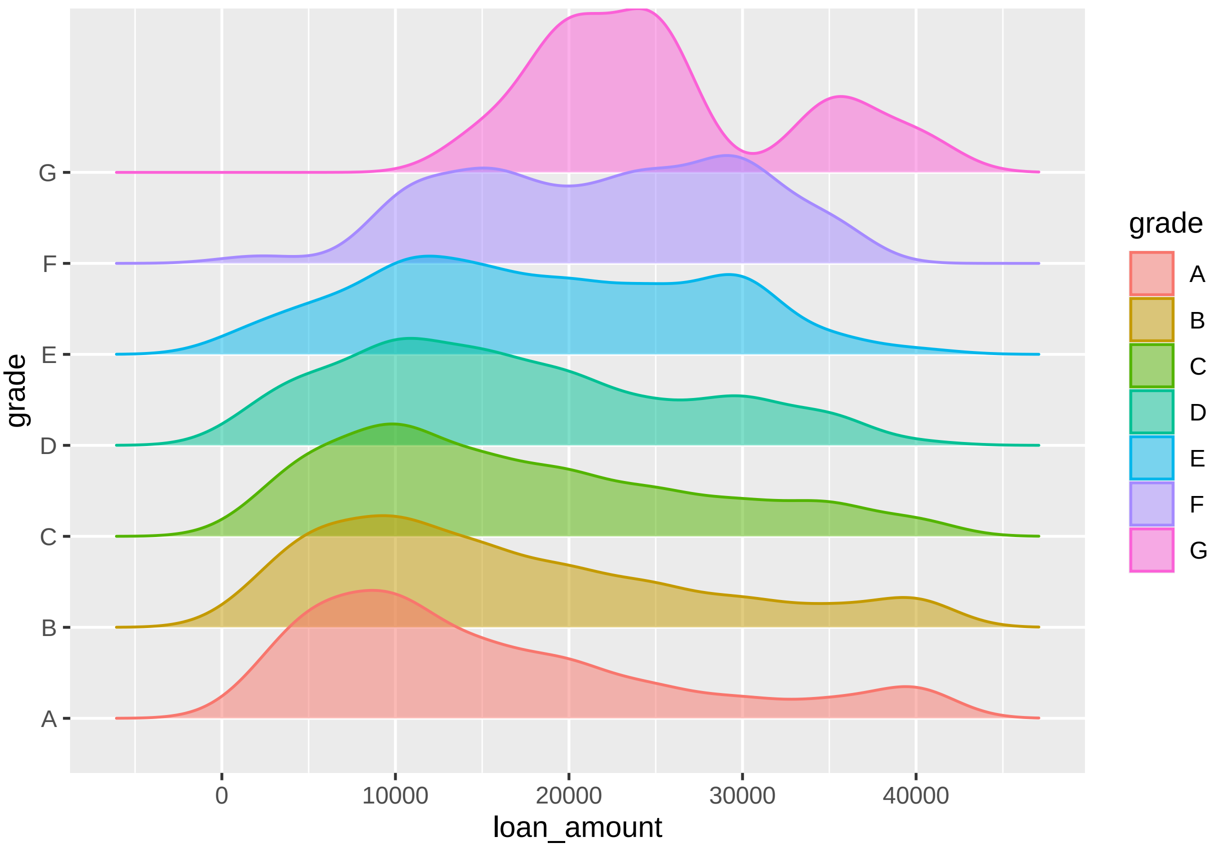
Ridge Plots

```r
library(ggridges) #load ggridges package
```

```
## Warning: package 'ggridges' was built under R version 4.2.3
```

```r
ggplot(loans, aes(x = loan_amount, y = grade, fill = grade, color = grade)) +
 geom_density_ridges(alpha = 0.5) #plot ridge plot
```

```
## Picking joint bandwidth of 2360
```


G
F
E
D
C
B
A
grade
0
10000
20000
30000
40000
loan_amount
grade
A
B
C
D
E
F
G