Challenge-7

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Practice:

```
# Enter code here
library(tidyverse)
```

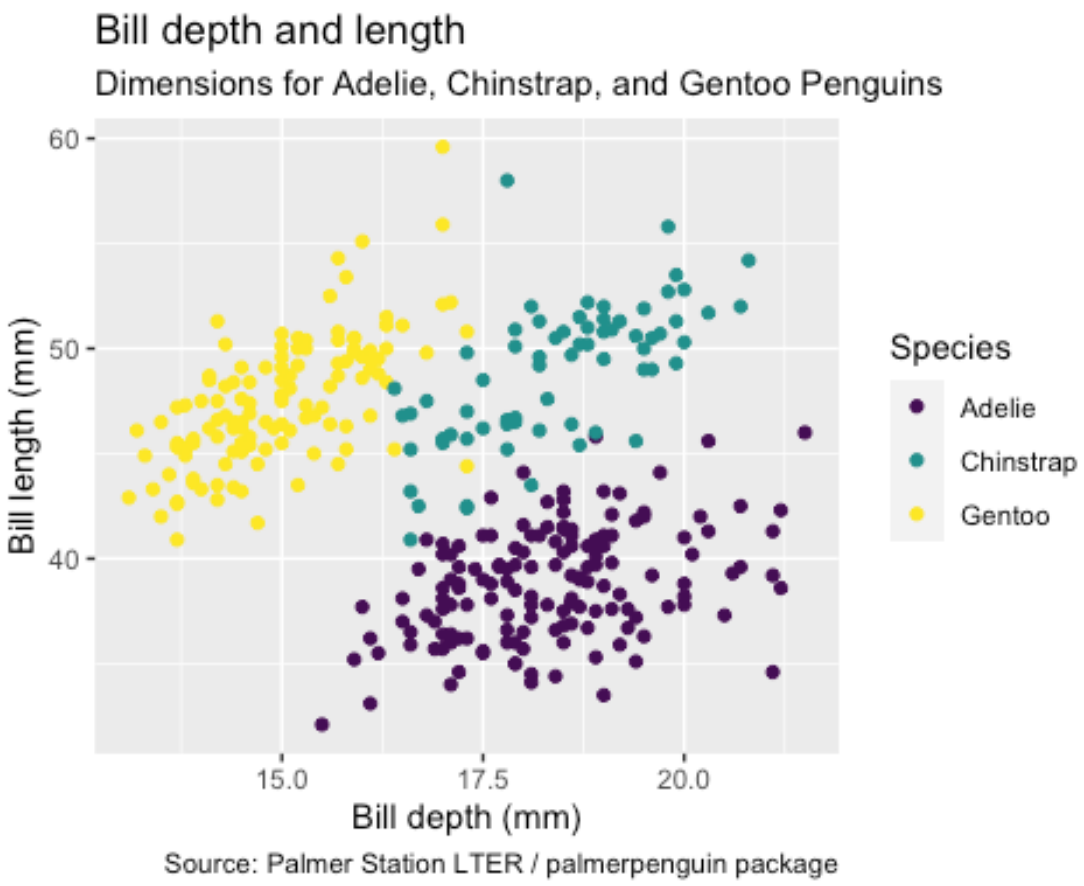
```
## ── Attaching core tidyverse packages ──────────────────────── tidyverse
2.0.0 ──
## ✔ dplyr     1.1.2     ✔ readr     2.1.4
## ✔ forcats   1.0.0     ✔ stringr   1.5.0
## ✔ ggplot2   3.4.3     ✔ tibble    3.2.1
## ✔ lubridate 1.9.2     ✔ tidyr     1.3.0
## ✔ purrr     1.0.2
## ── Conflicts ────────────────────────────────────────── 
tidyverse_conflicts() ──
## ✖ dplyr::filter() masks stats::filter()
## ✖ dplyr::lag()    masks stats::lag()
## ℹ Use the conflicted package (<http://conflicted.r-lib.org/>) to force
all conflicts to become errors
```

```
library(palmerpenguins)
glimpse(penguins)
```

```
## 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…
```

Plot recreation:

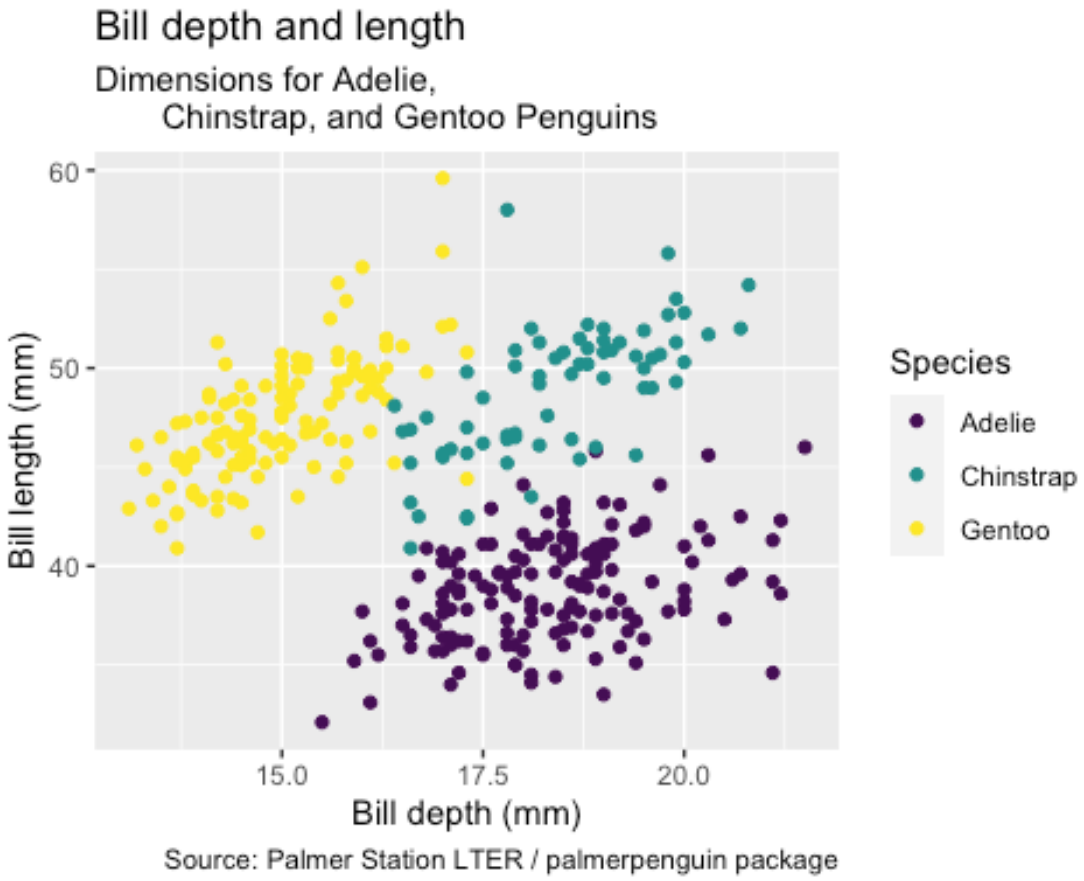
```
ggplot(data = penguins,
       mapping = aes(x = bill_depth_mm,
                     y = bill_length_mm,
                     colour = species)) +
  geom_point() +
  labs(title = "Bill depth and length",
       subtitle = "Dimensions for Adelie, Chinstrap, and Gentoo Penguins",
       x = "Bill depth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



Palmer Penguins: Argument names:

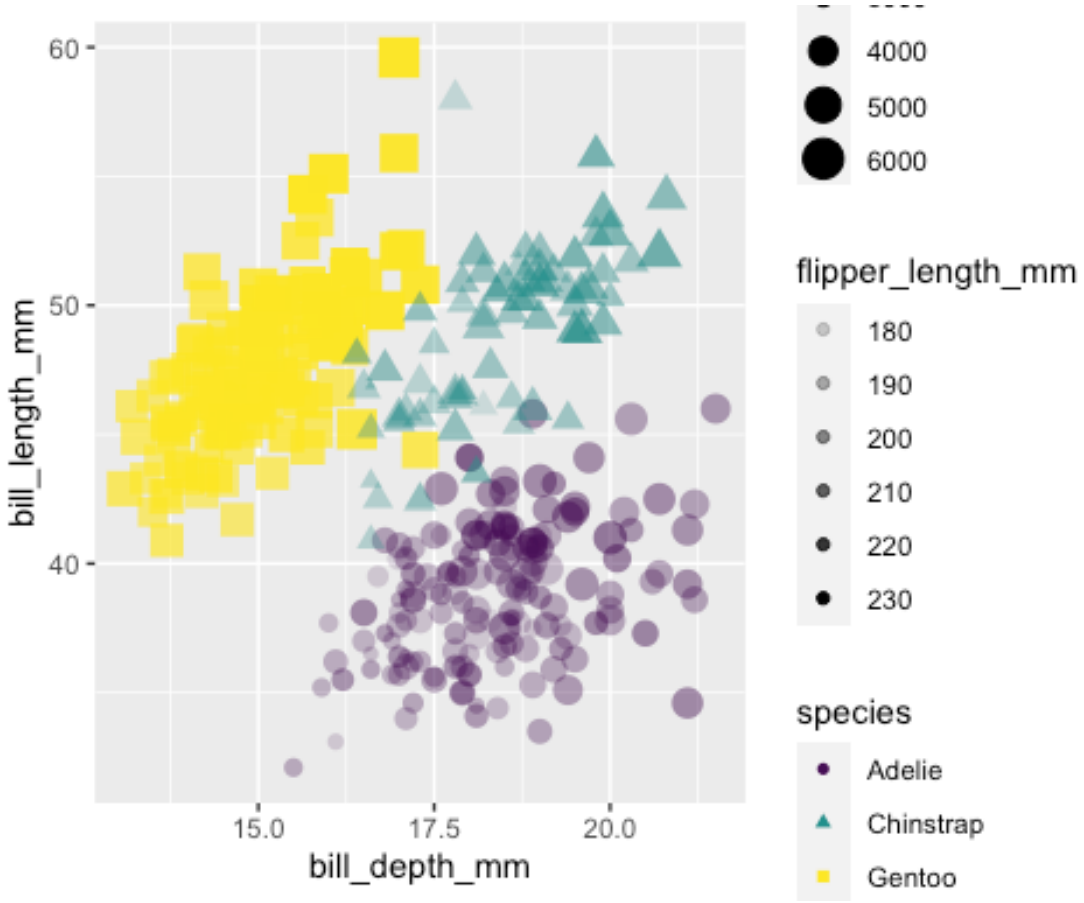
```
ggplot(penguins,
    aes(x = bill_depth_mm,
        y = bill_length_mm,
        colour= species)) +
  geom_point() +
  labs(title = "Bill depth and length",
       subtitle = "Dimensions for Adelie,
```

```
       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()`).
```



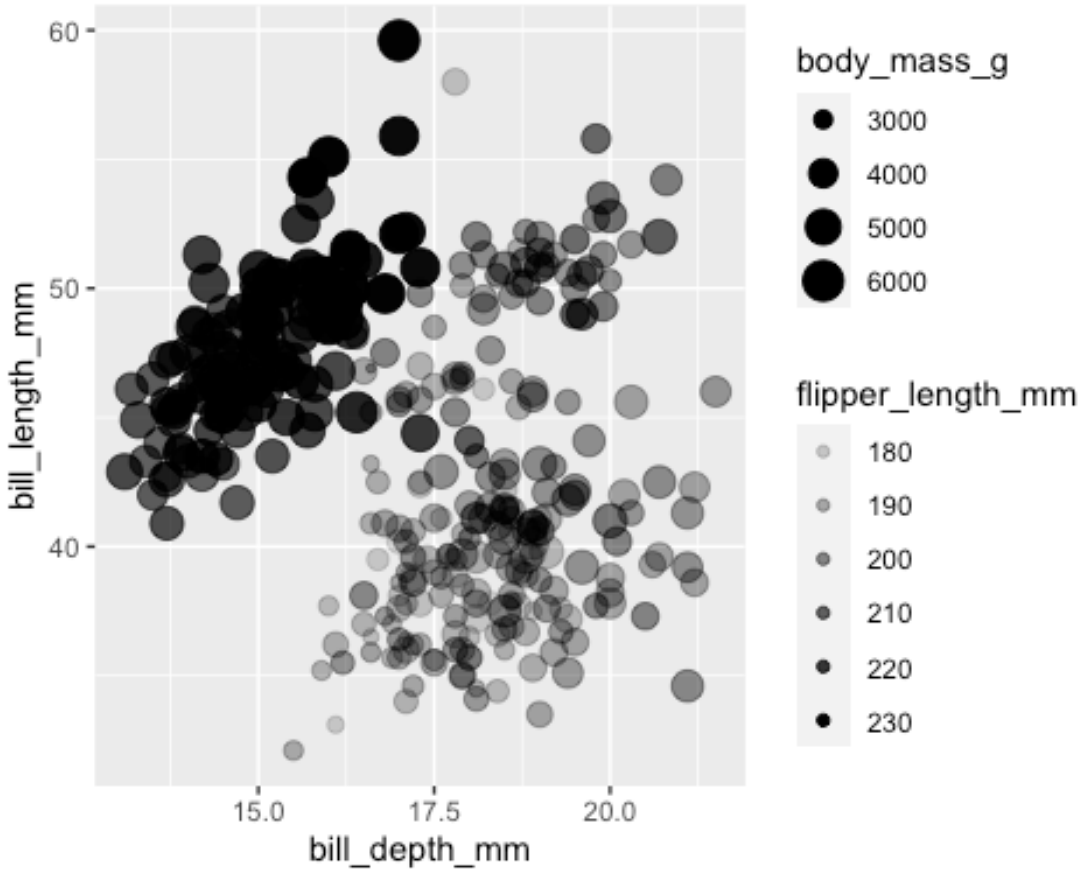
Palmer Penguins:Aesthetics Options:

```
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()`).
```



Mapping:

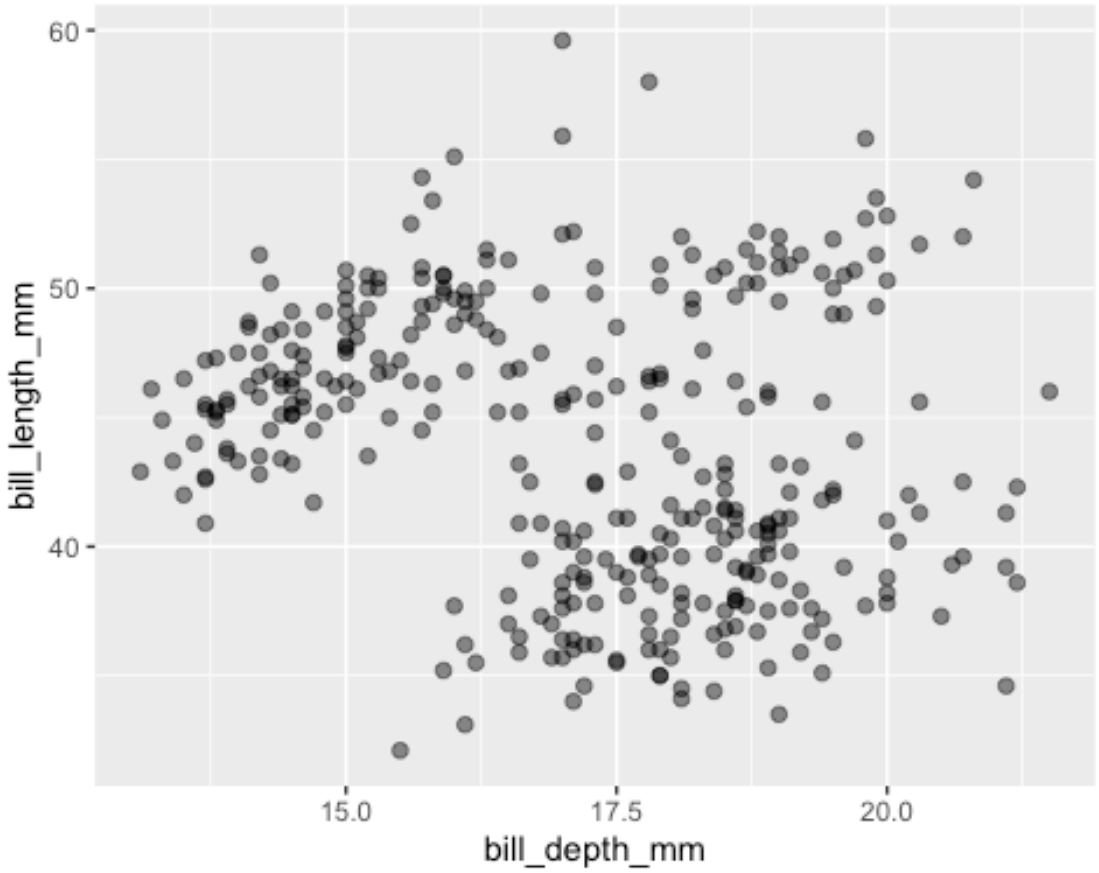
```
ggplot(penguins) +
  aes(x = bill_depth_mm,
      y = bill_length_mm,
      size = body_mass_g,
      alpha = flipper_length_mm) +
geom_point()

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



Setting:

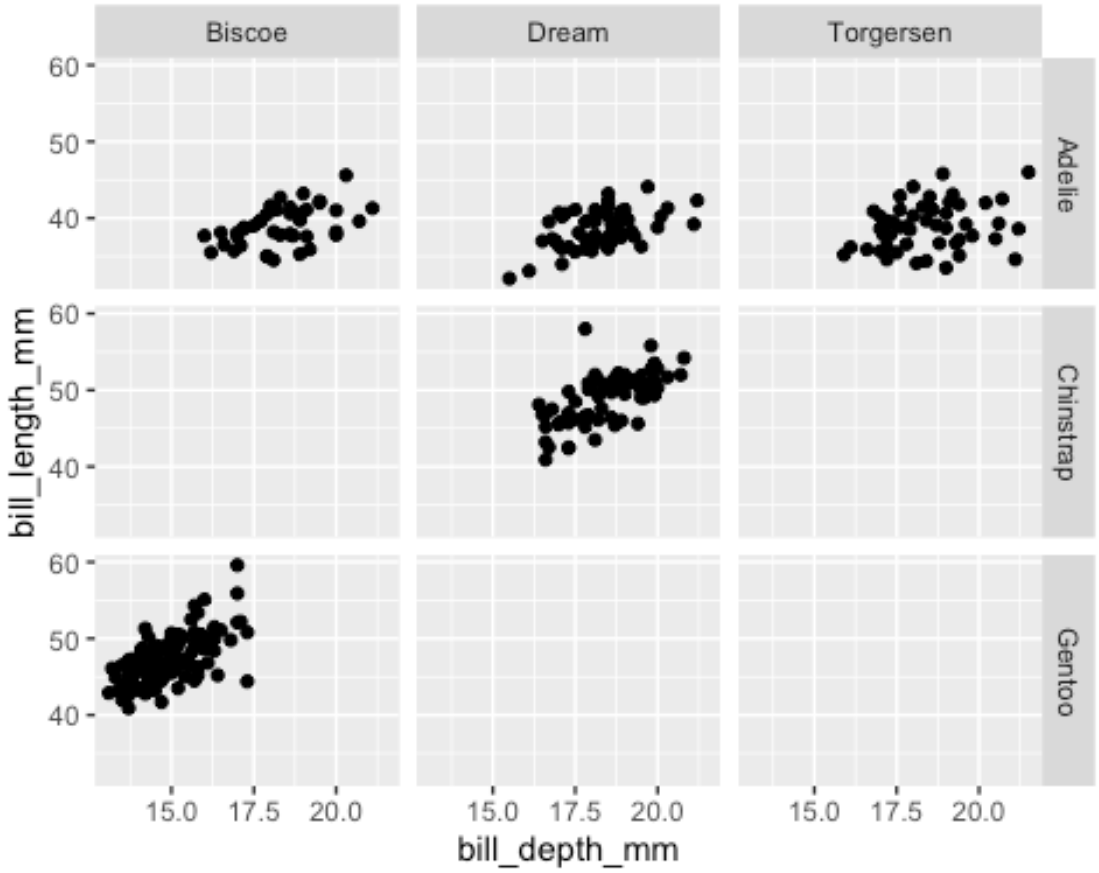
```
ggplot(penguins) +
  aes(x = bill_depth_mm,
      y = bill_length_mm) +
  geom_point(size = 2, alpha = 0.5)
```

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



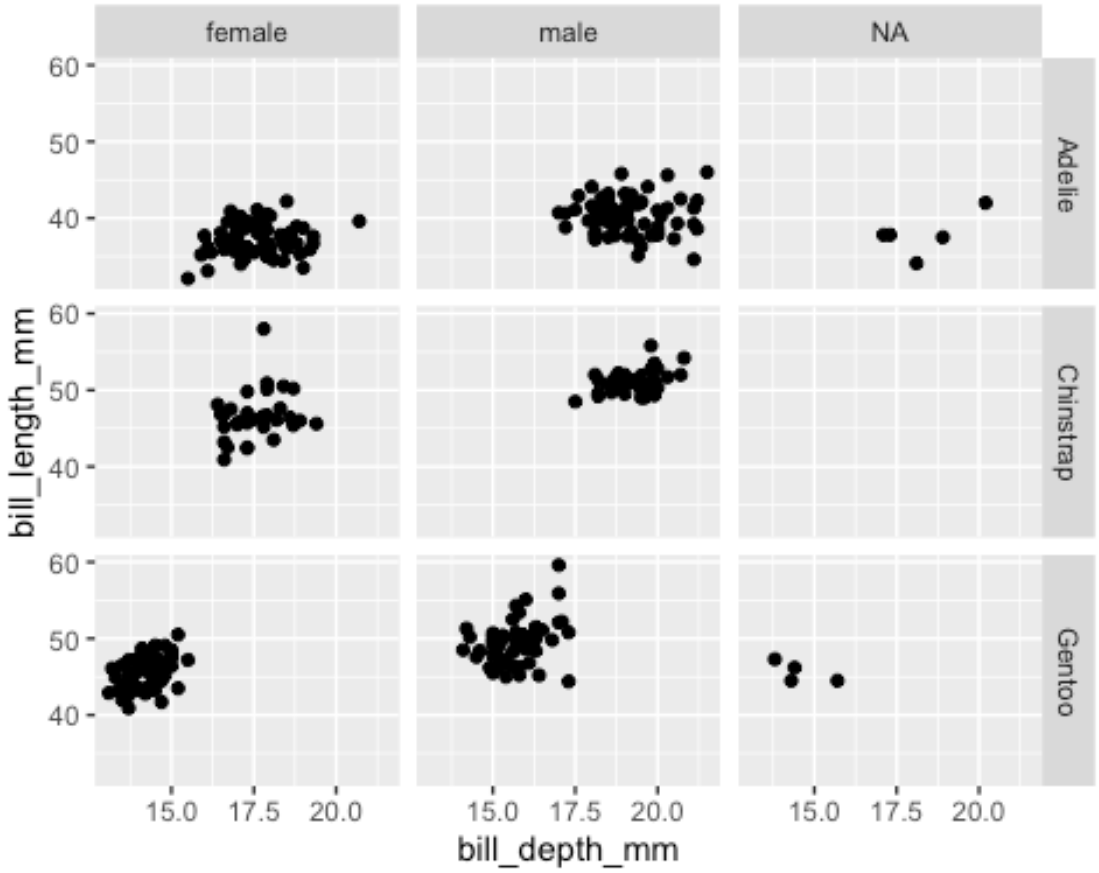
Faceting:

```
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()`).
```



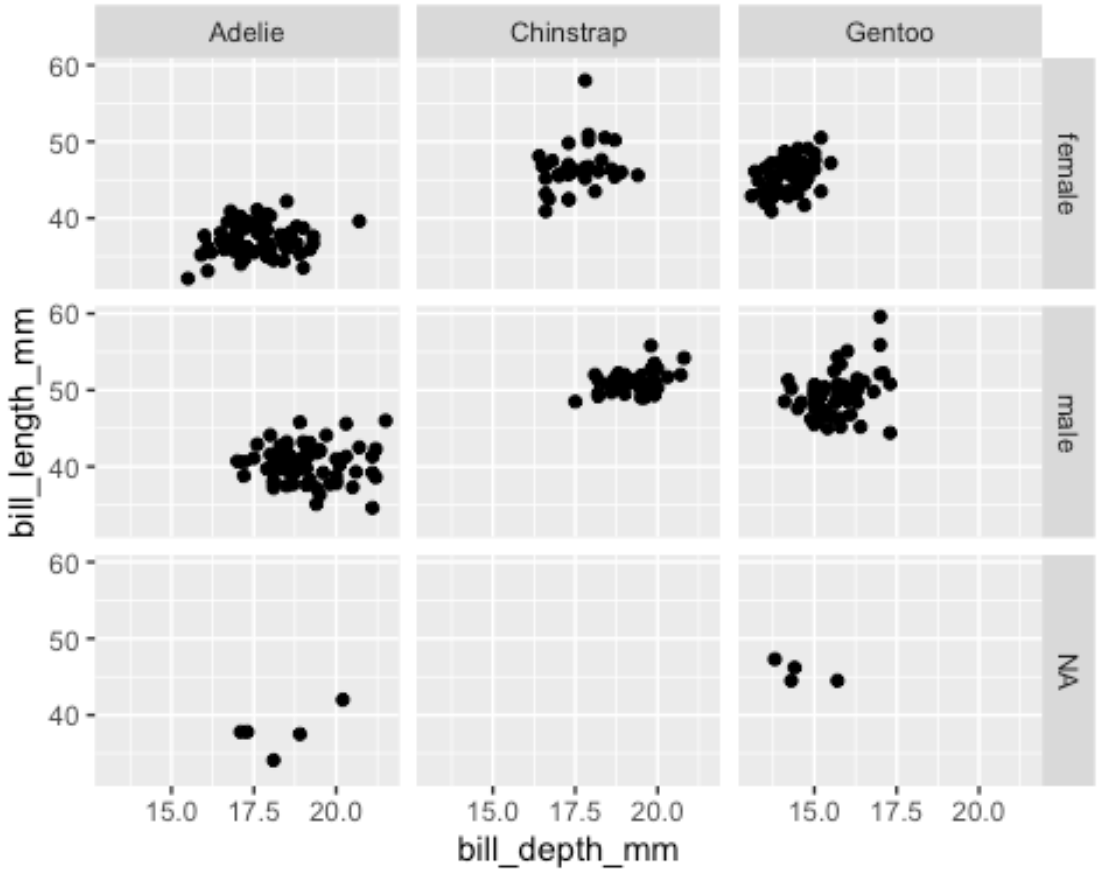
Facet 2:

```
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()`).
```



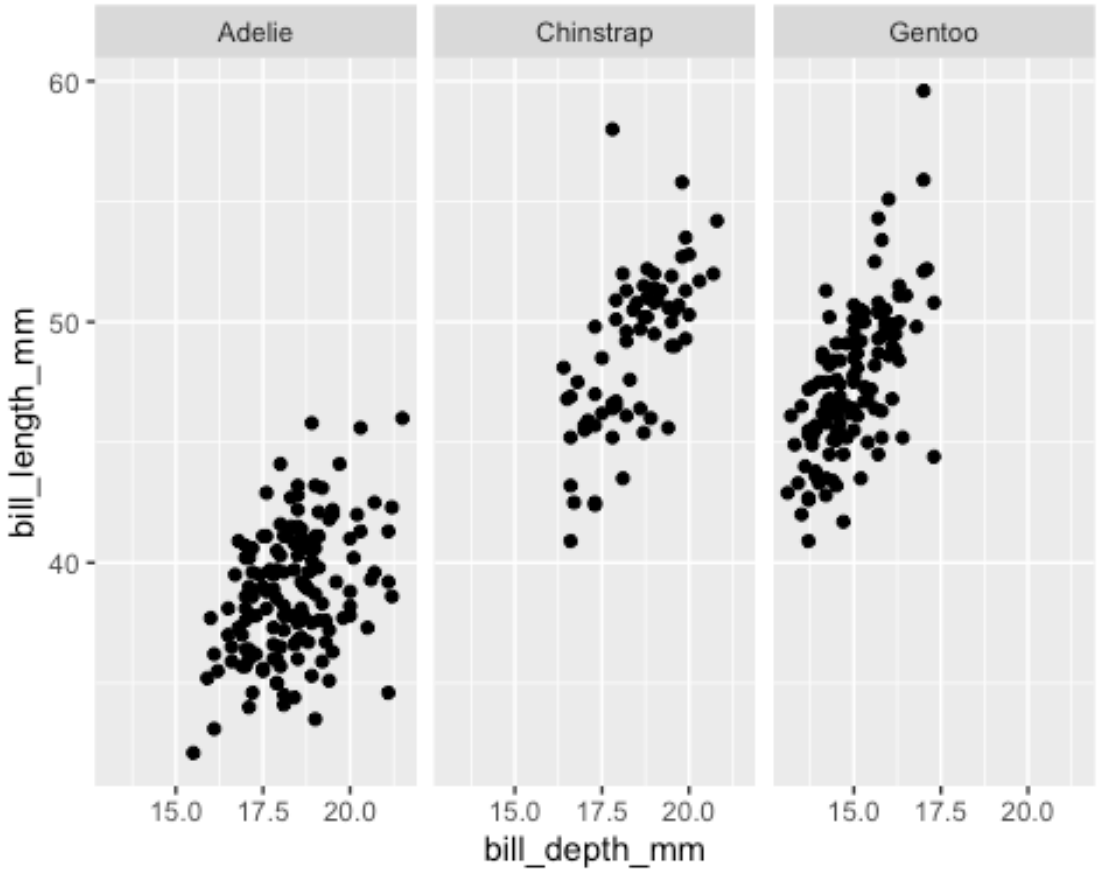
Facet 3:

```
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()`).
```



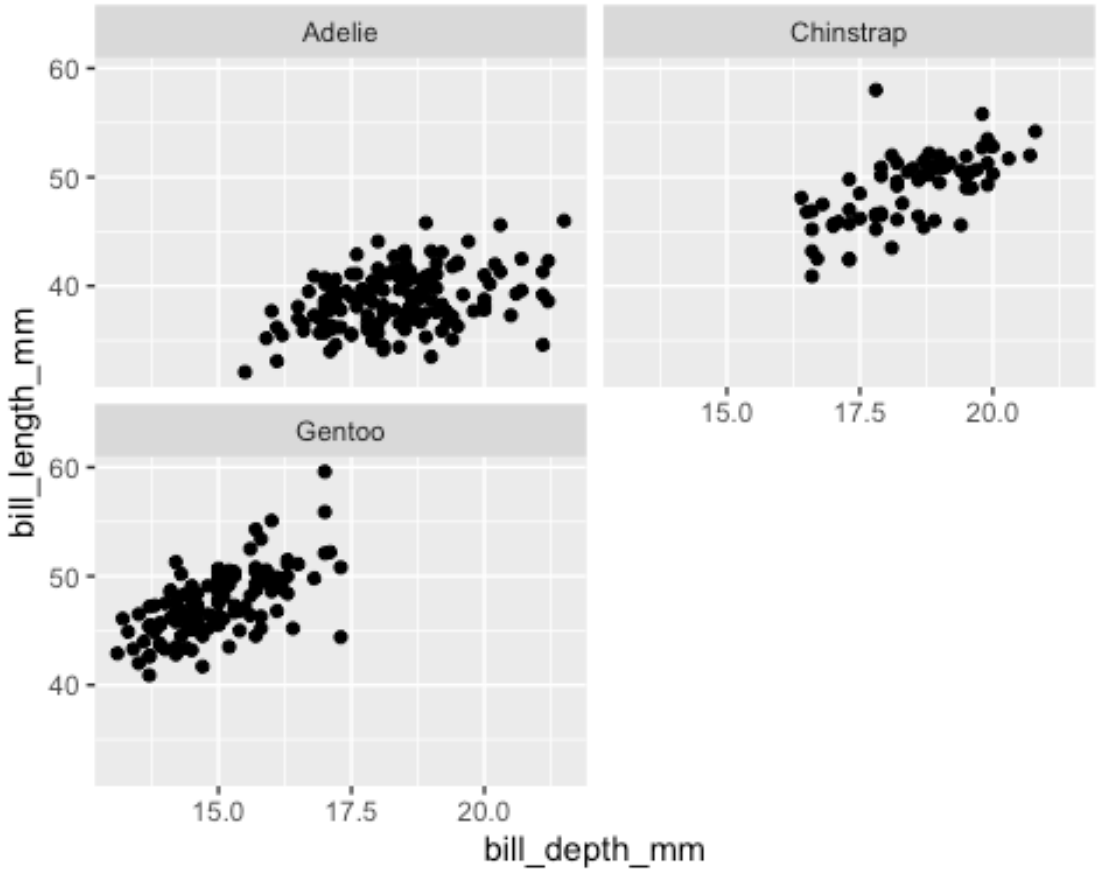
Facet 4:

```
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()`).
```



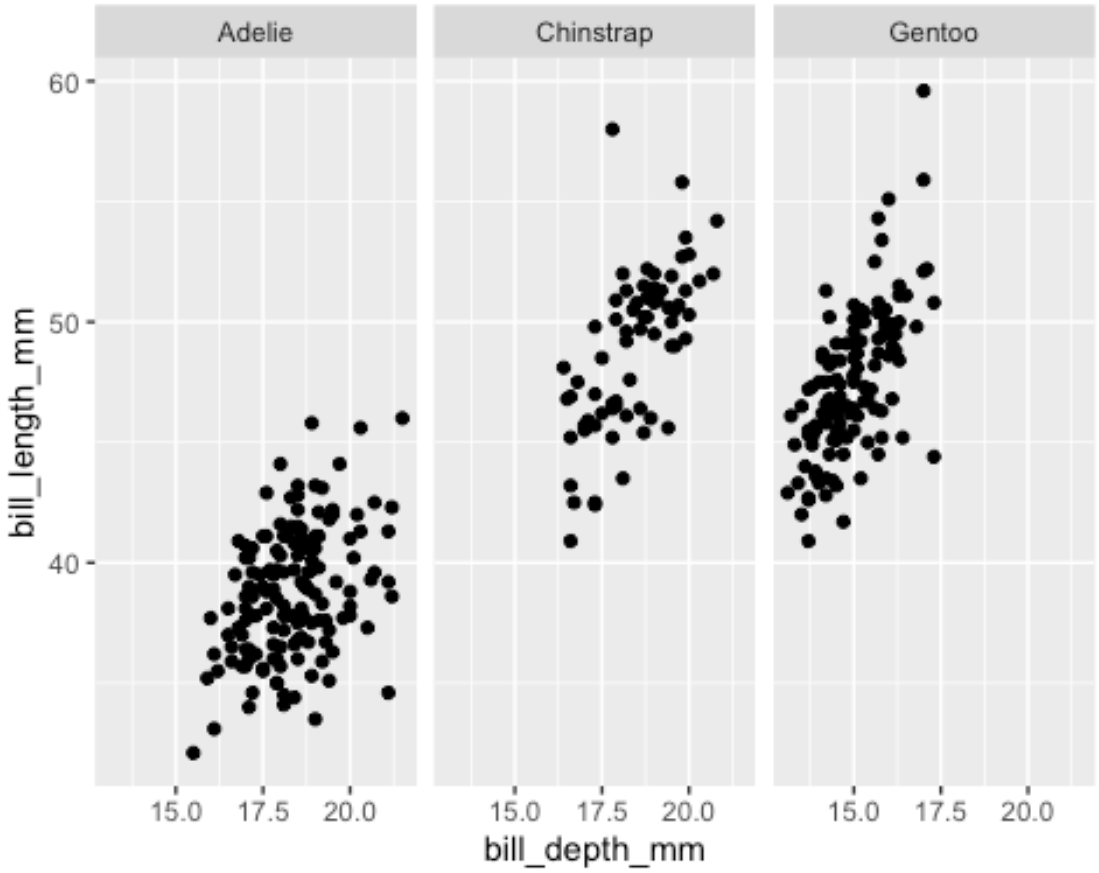
Facet 5:

```
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()`).
```



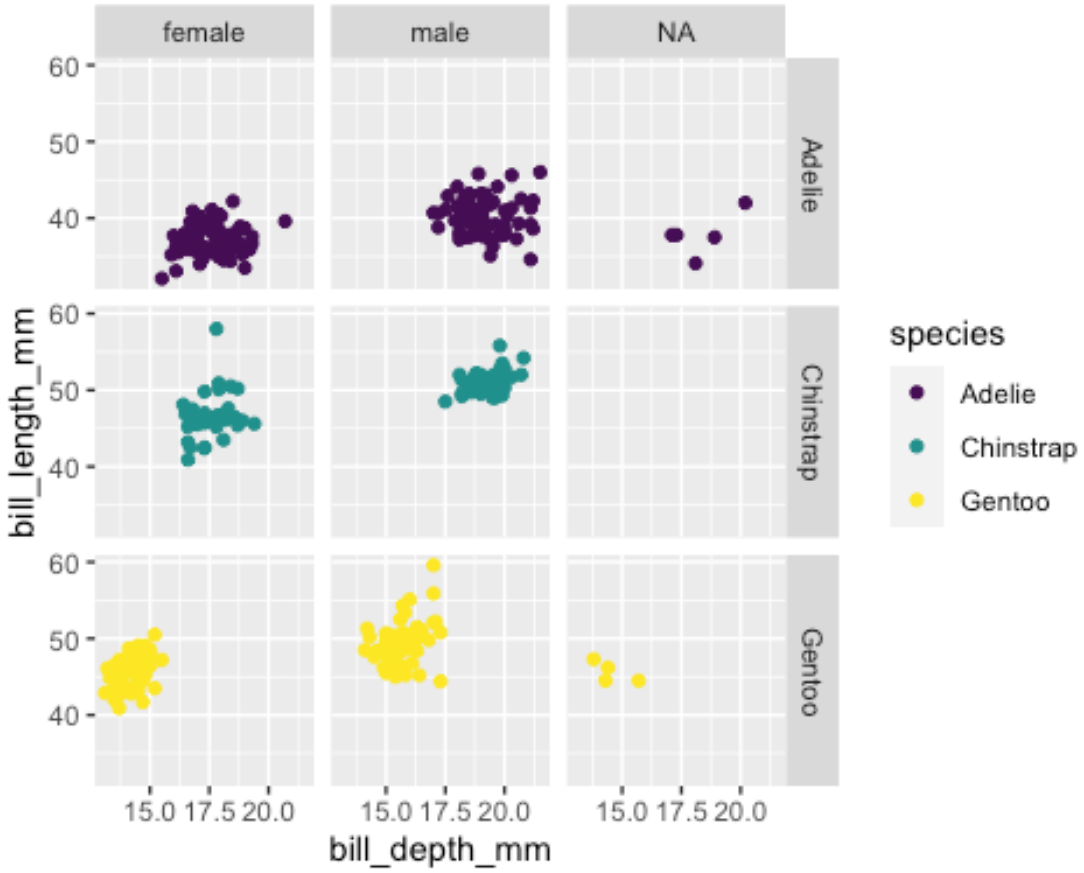
Facet 6:

```
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()`).
```



Facet and Colour:

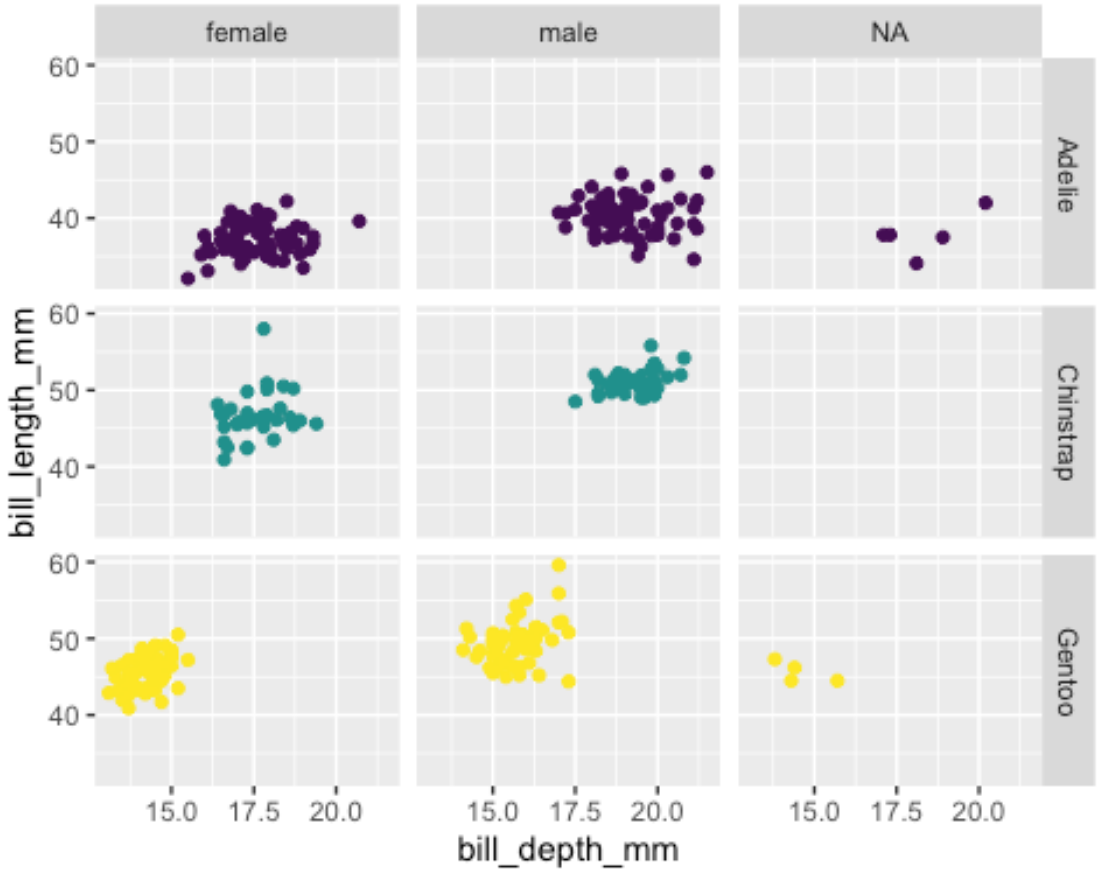
```
ggplot(penguins,
       aes(x = bill_depth_mm,
           y = bill_length_mm,
           color = species)) +
geom_point() +
  facet_grid(species ~ sex) +
  scale_color_viridis_d()

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



Face and color, no legend:

```
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")
```

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



Dataset 2: Lending Club

```
library(openintro)
```

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

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

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

```
glimpse(loans_full_schema)
```

```
## 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 Variable:

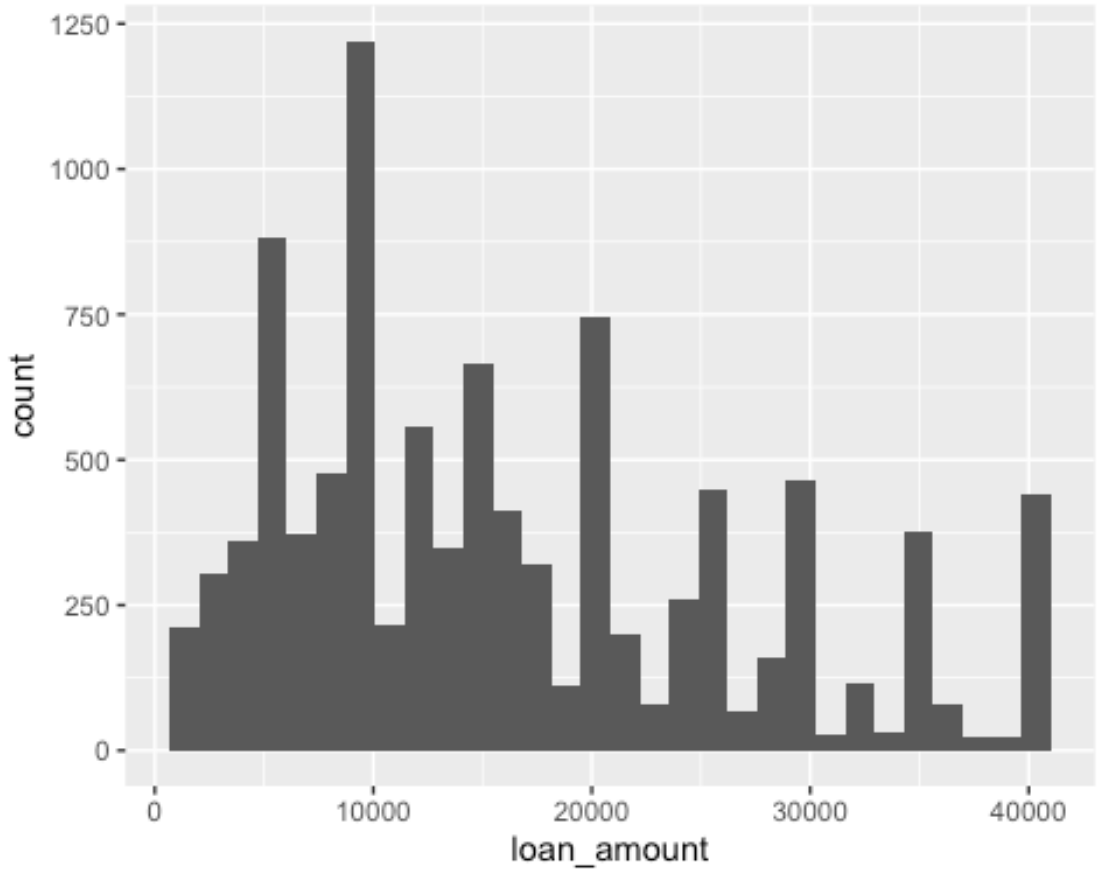
```
loans <- loans_full_schema %>%
  select(loan_amount, interest_rate, term, grade,
         state, annual_income, homeownership, debt_to_income)
glimpse(loans)
```

```
## 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

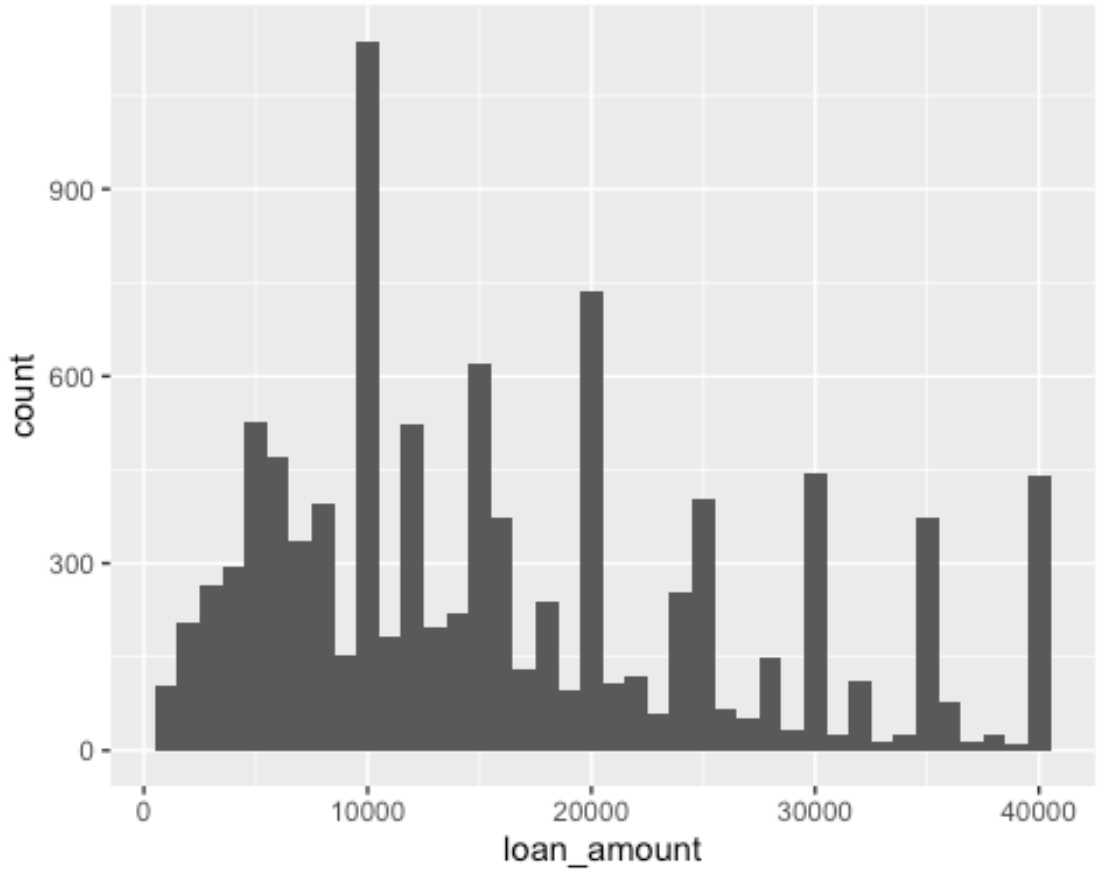
```
ggplot(loans) +
  aes(x = loan_amount) +
geom_histogram()
```

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



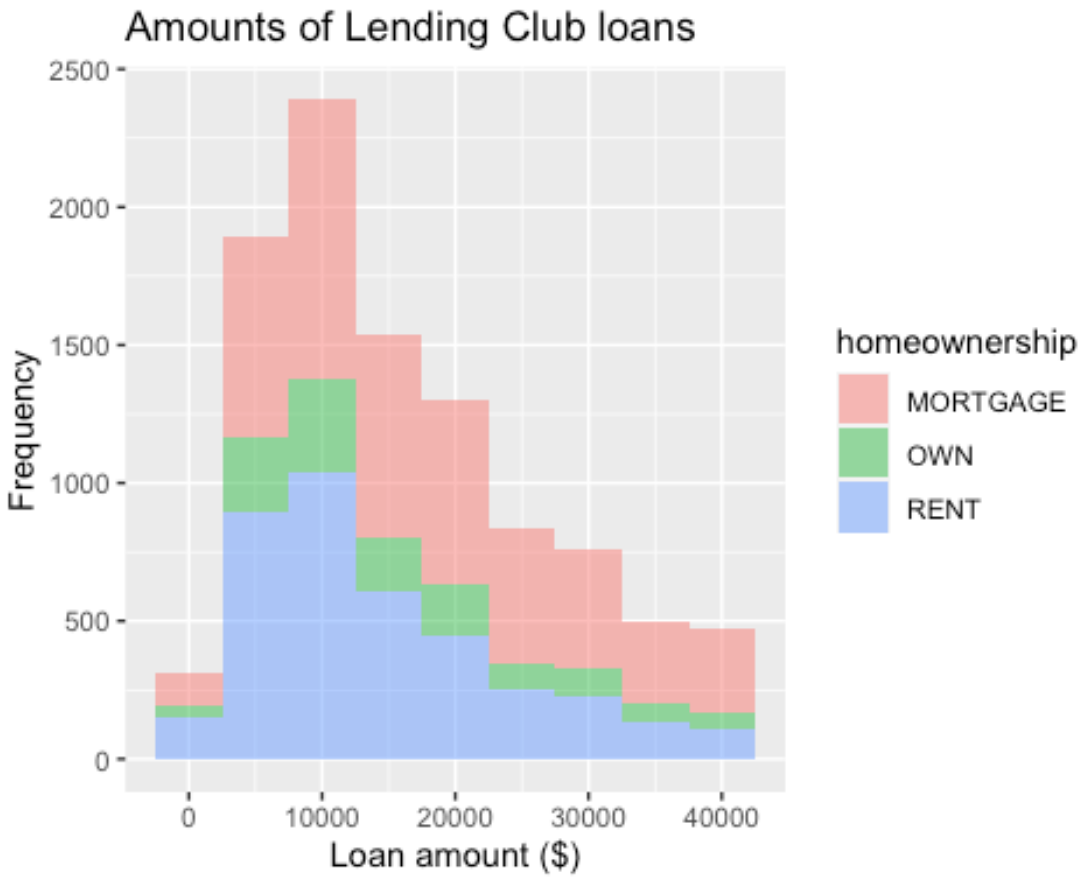
Histograms and binwidth=1000:

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



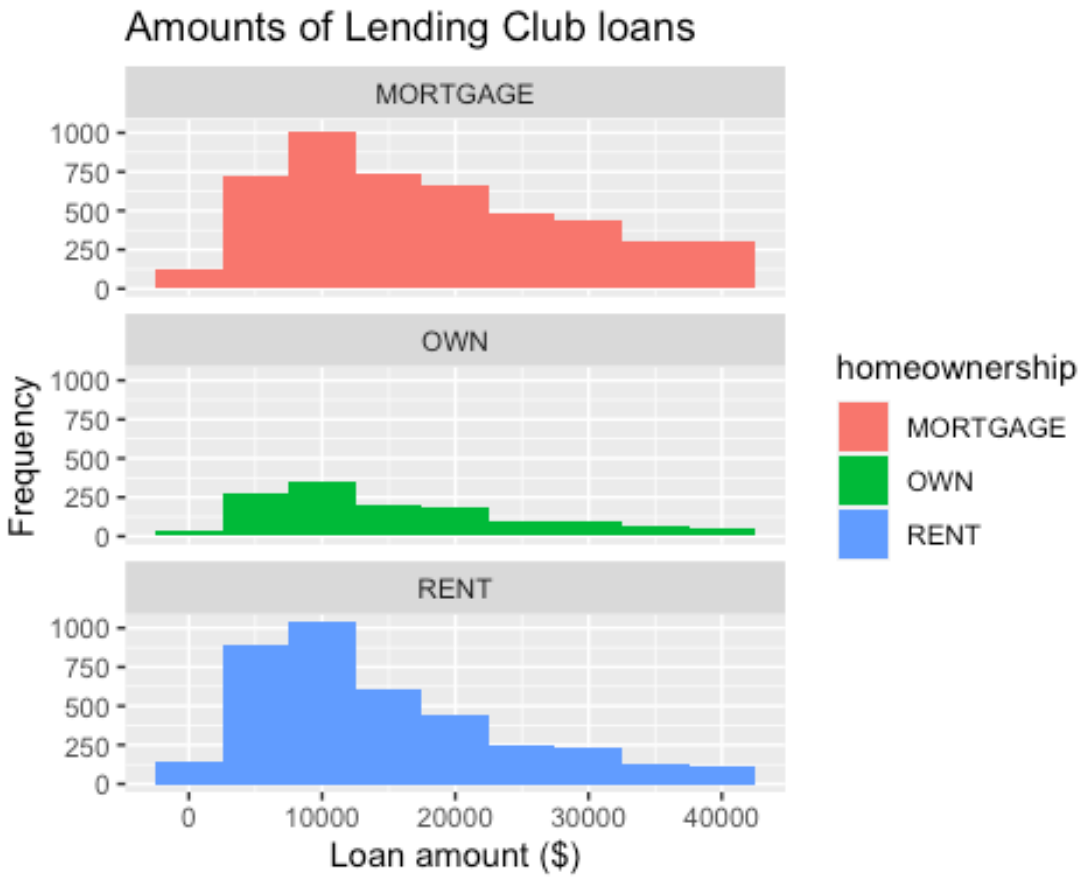
Customising Histogram

```
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")
```



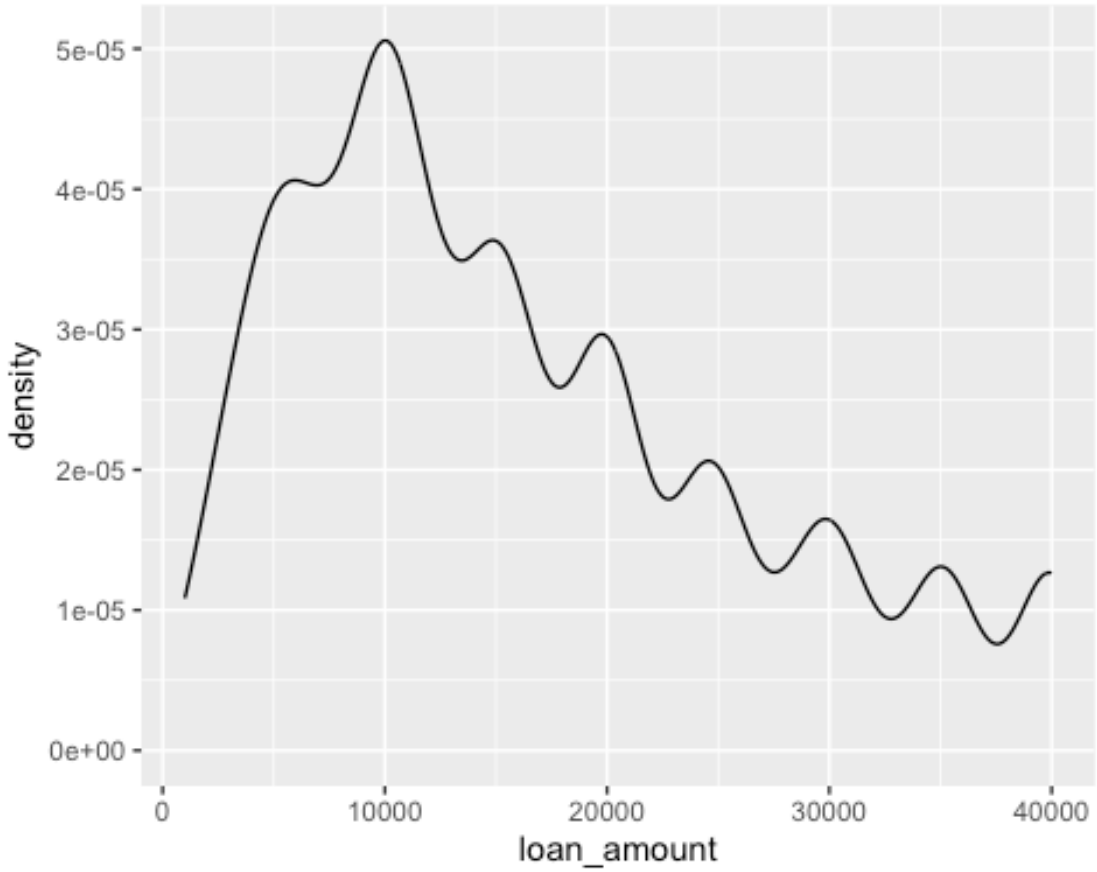
**Facet with a categorical Variable:

```
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)
```



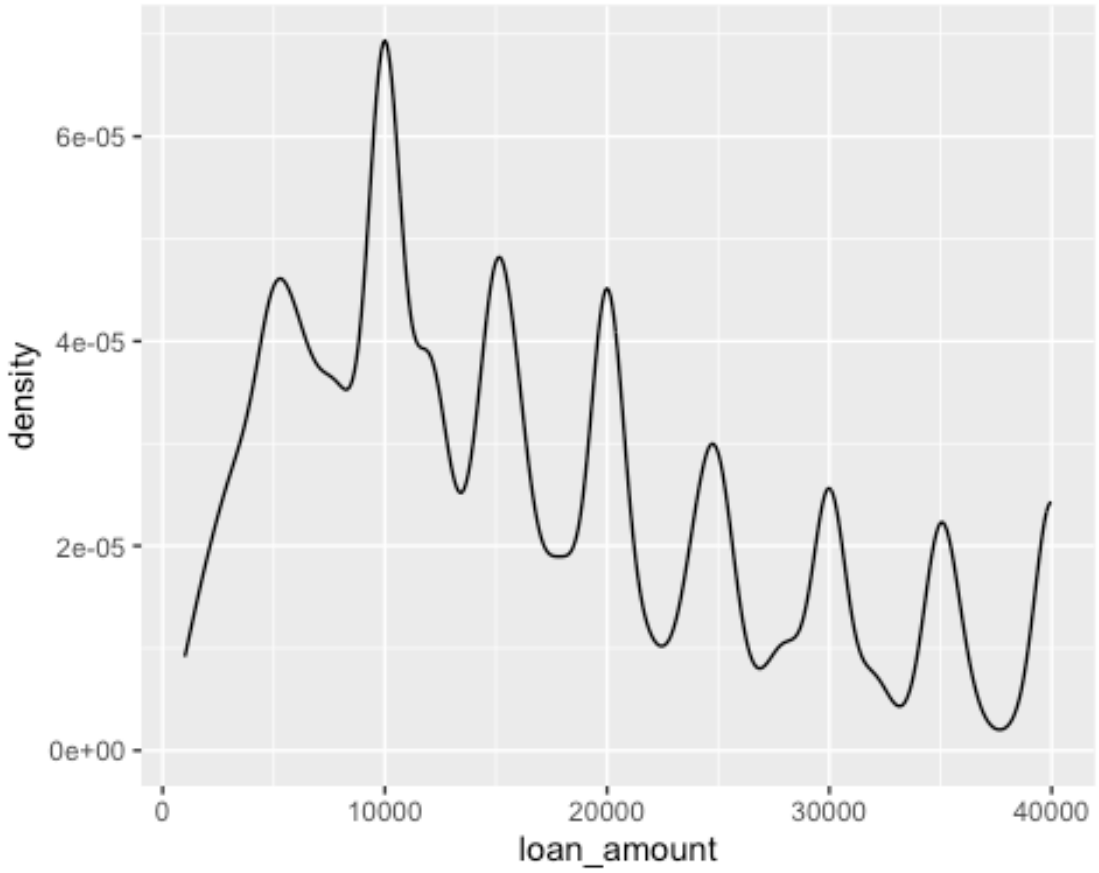
Density Plot:

```
ggplot(loans, aes(x = loan_amount)) +
geom_density()
```



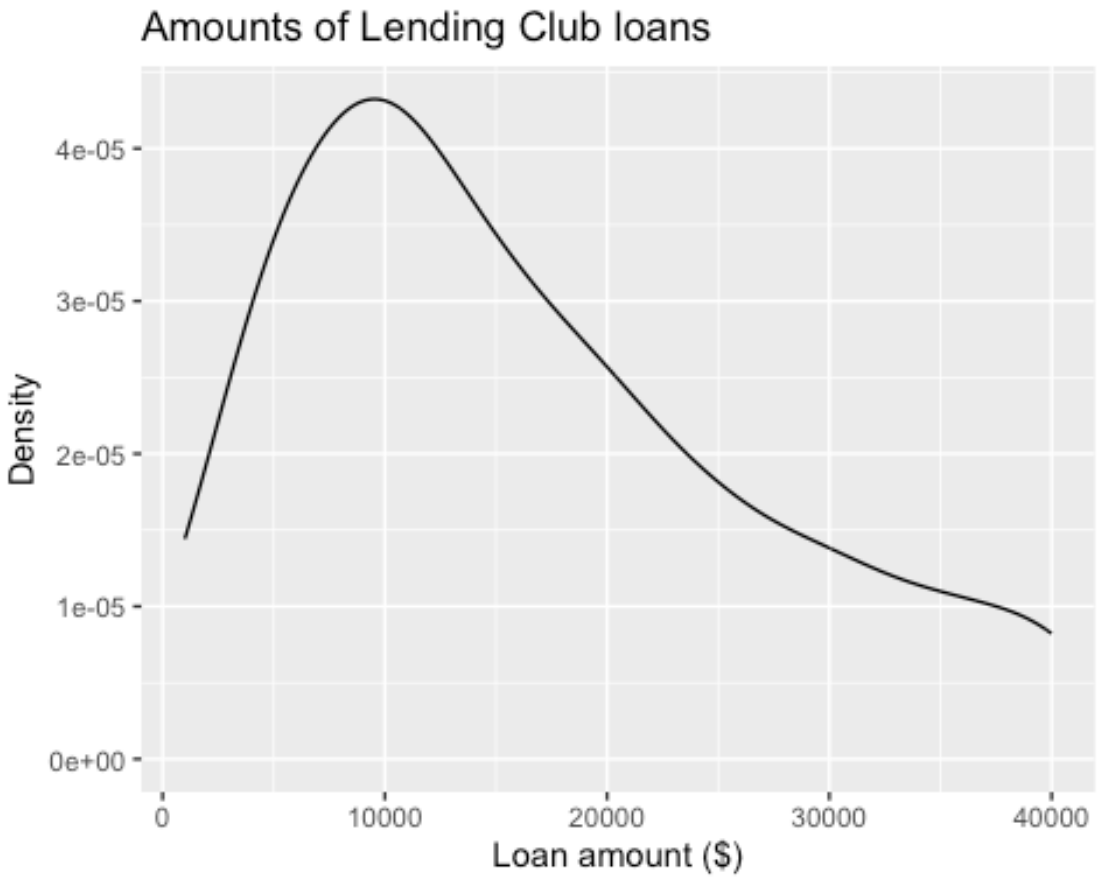
Density Plot and adjusting bandwidth:

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

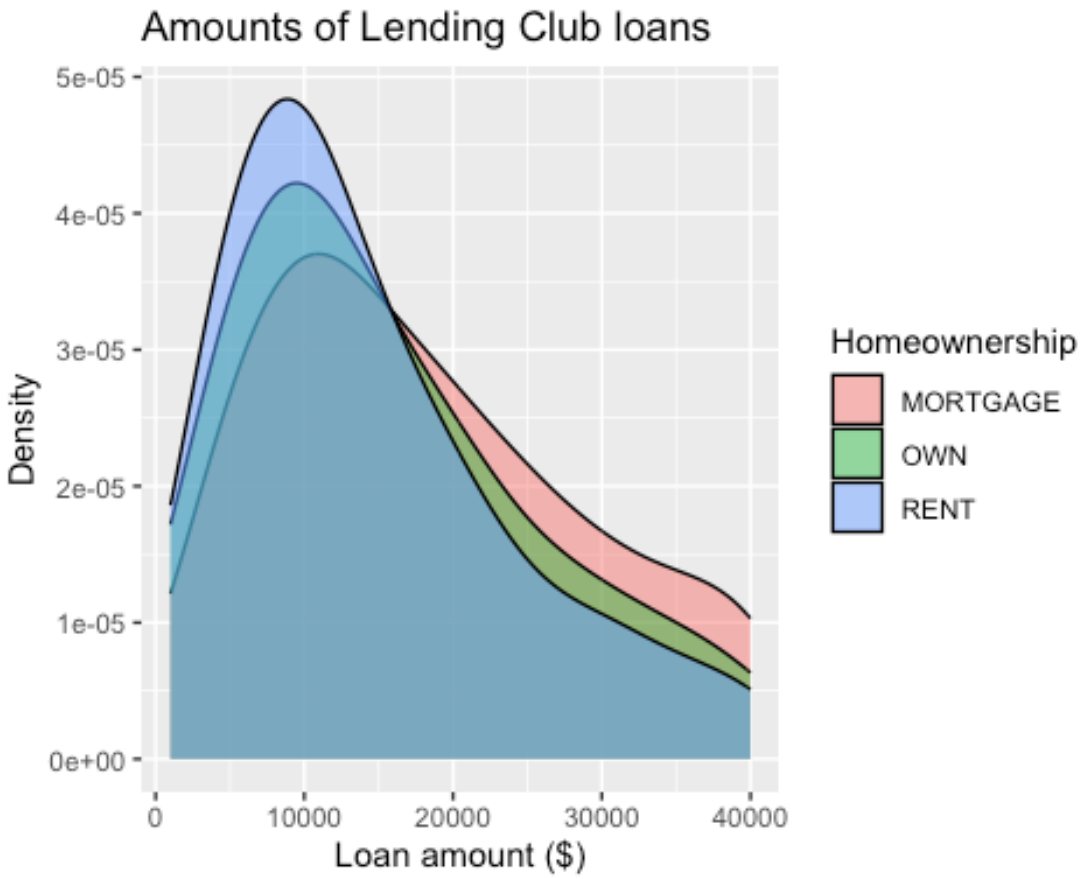


Customising density plots:

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

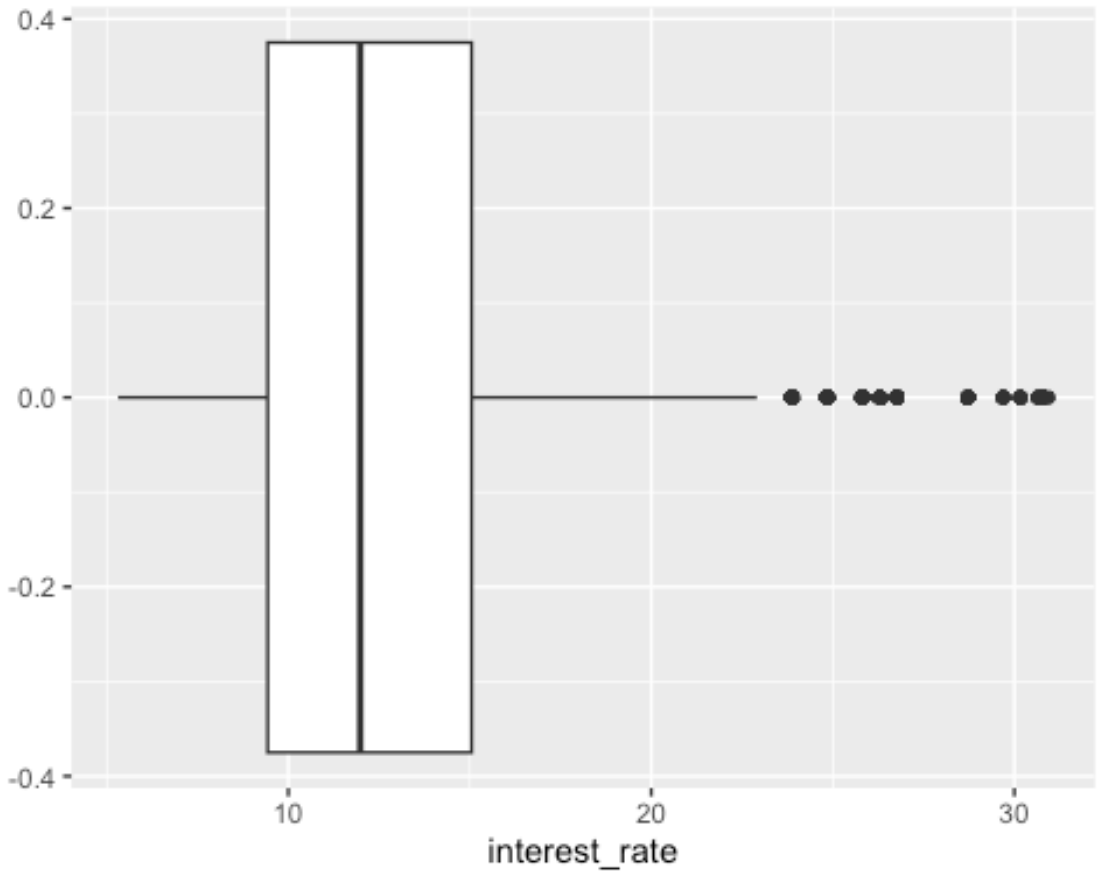



```
ggplot(loans, aes(x = loan_amount, fill = homeownership)) +
geom_density(adjust = 2, alpha = 0.5) +
labs(x = "Loan amount ($)",y = "Density",title = "Amounts of Lending Club
loans", fill = "Homeownership")
```



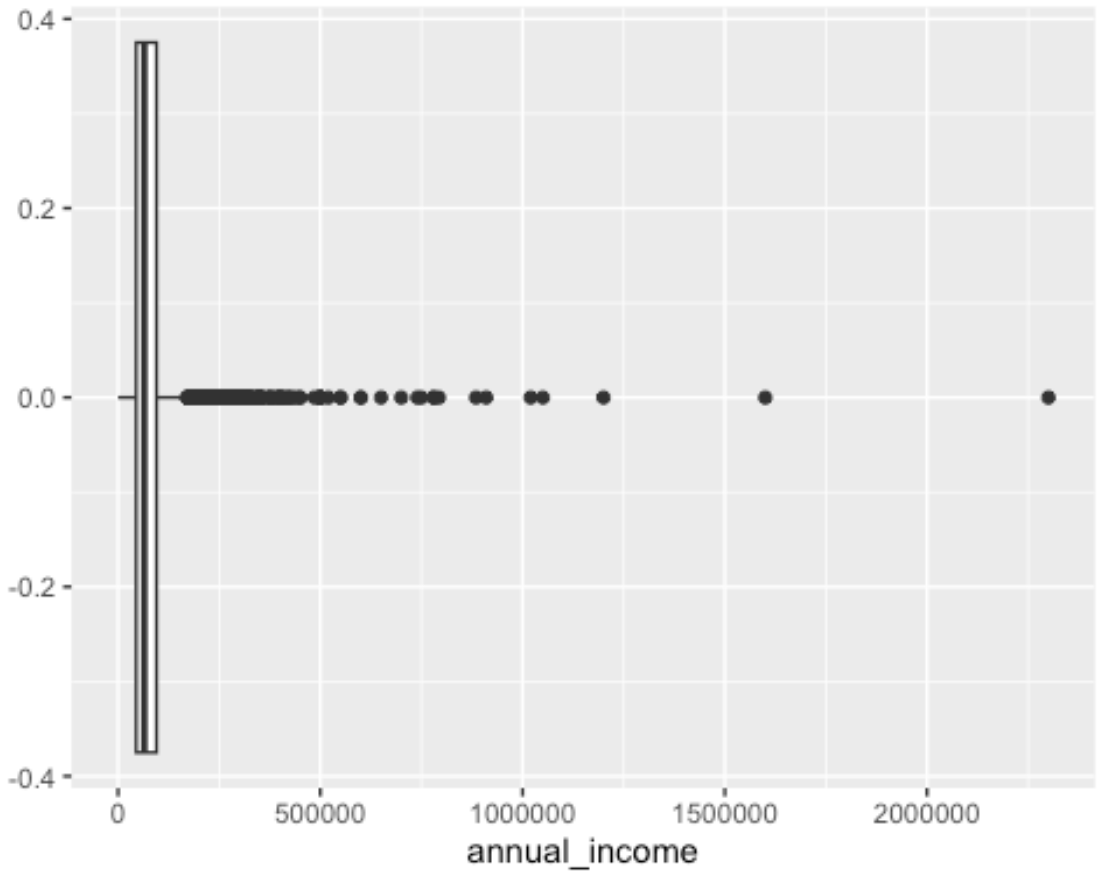
Box plots:

```
ggplot(loans, aes(x = interest_rate)) +
geom_boxplot()
```



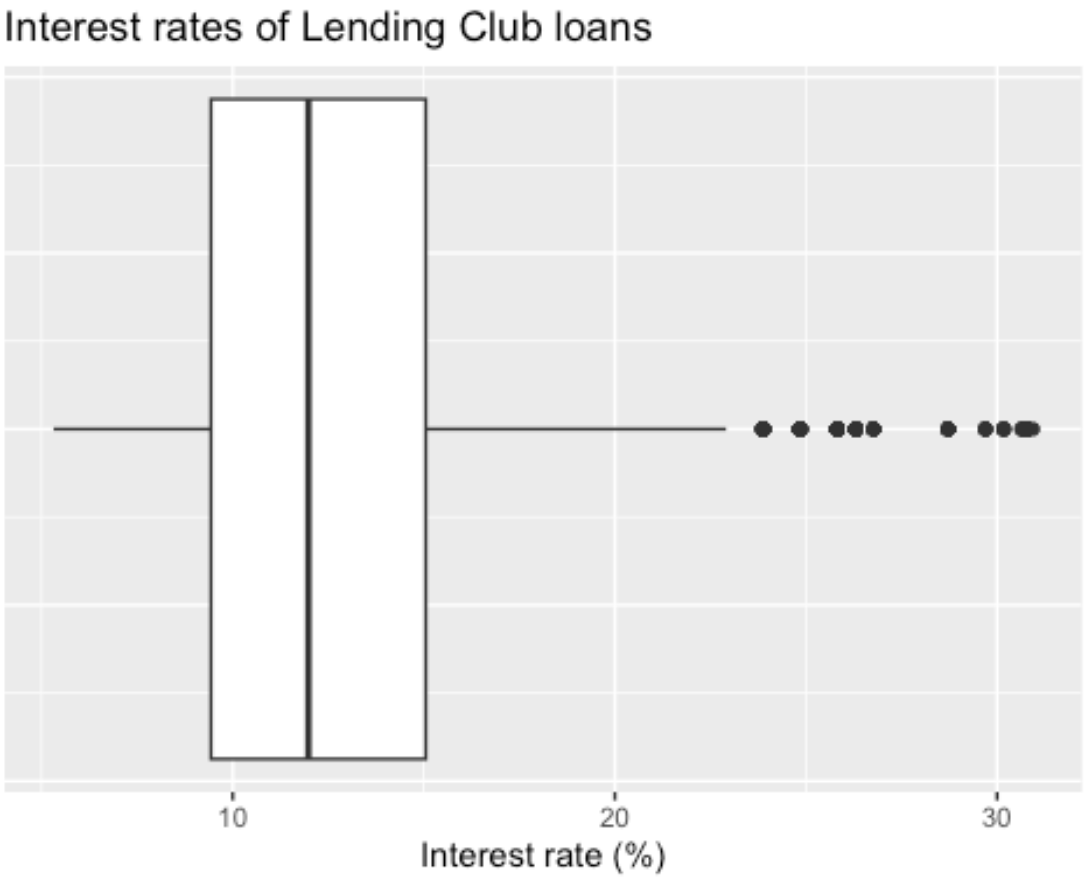
Box plots and outliers:

```
ggplot(loans, aes(x = annual_income)) +
geom_boxplot()
```



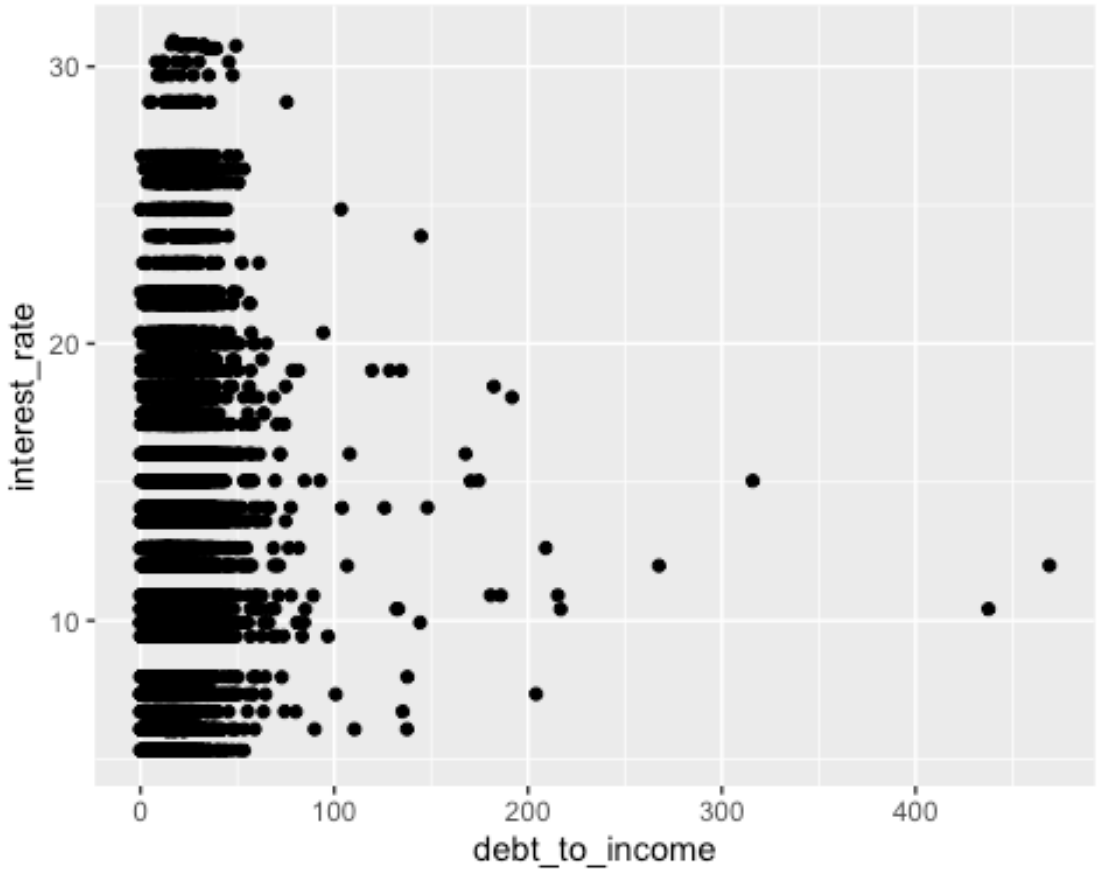
Customising Box Plots:

```
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() )
```



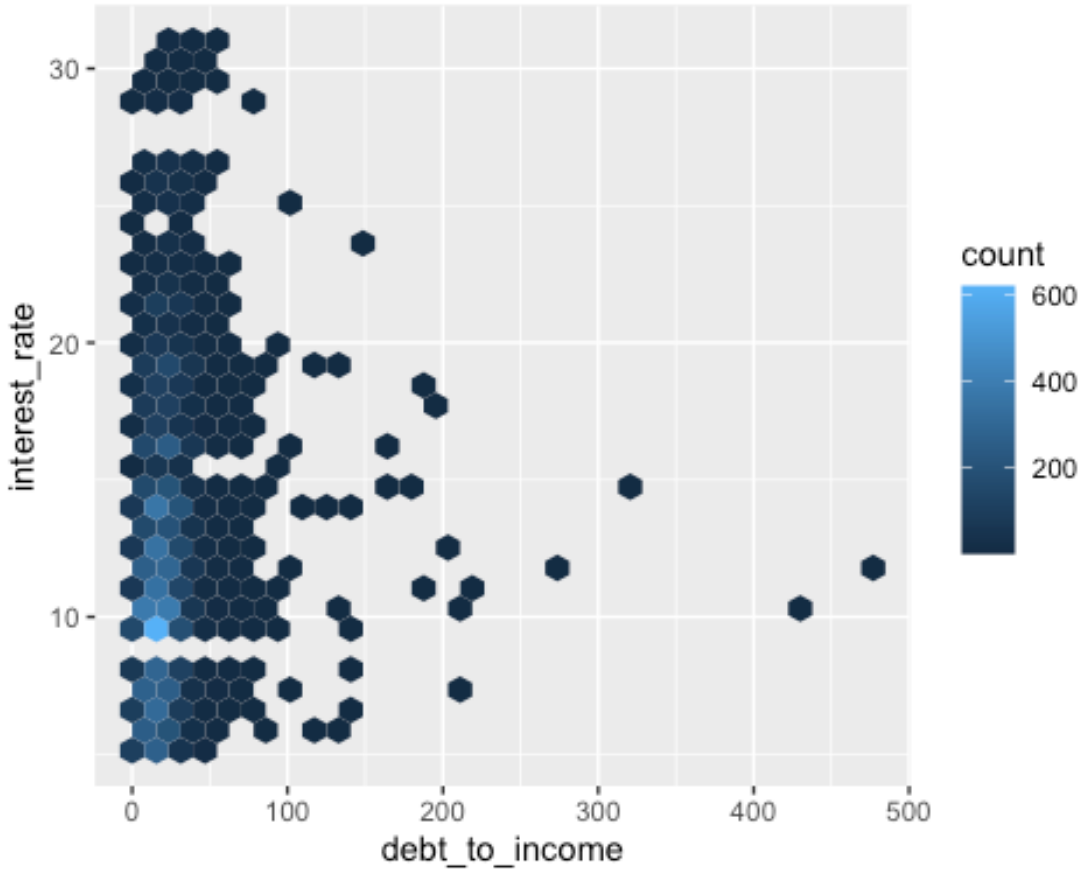
Scatterplot:

```
ggplot(loans,
       aes(x = debt_to_income, y = interest_rate)) +
geom_point()

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



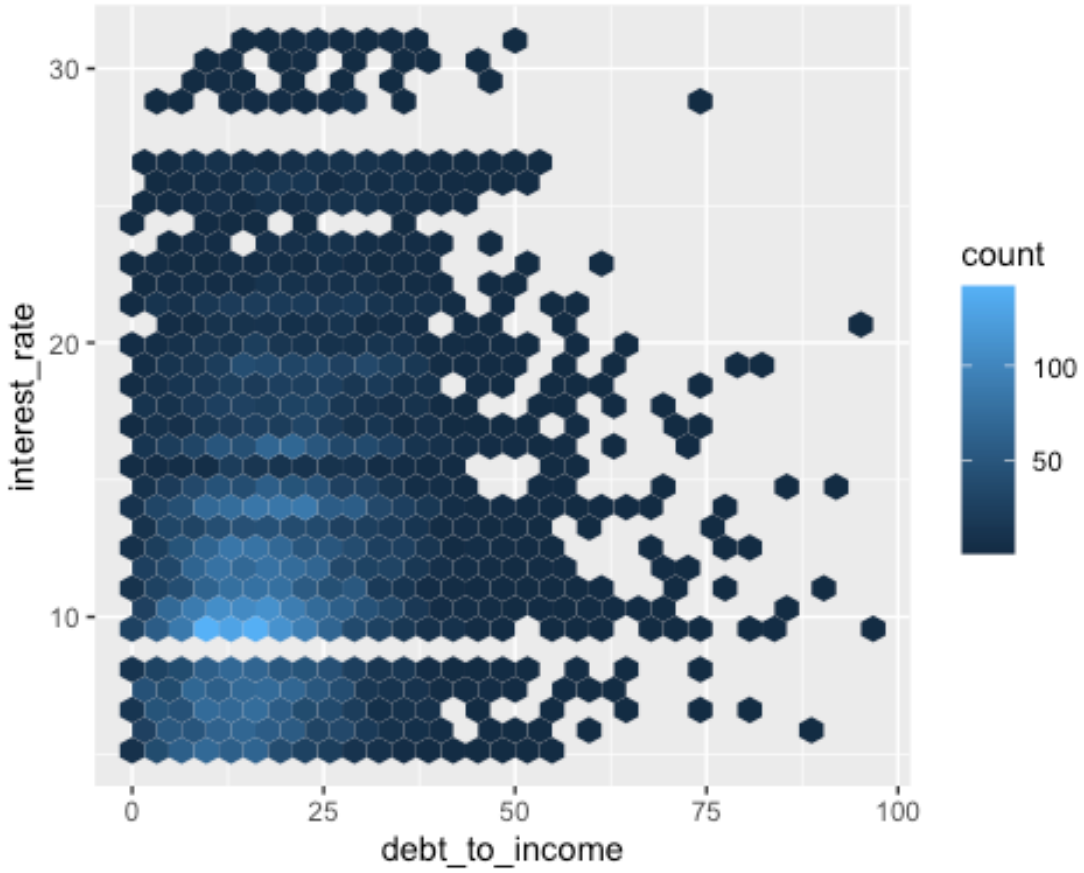
Hex plot:

```
library(hexbin)
ggplot(loans, aes(x = debt_to_income, y = interest_rate)) +
geom_hex()

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



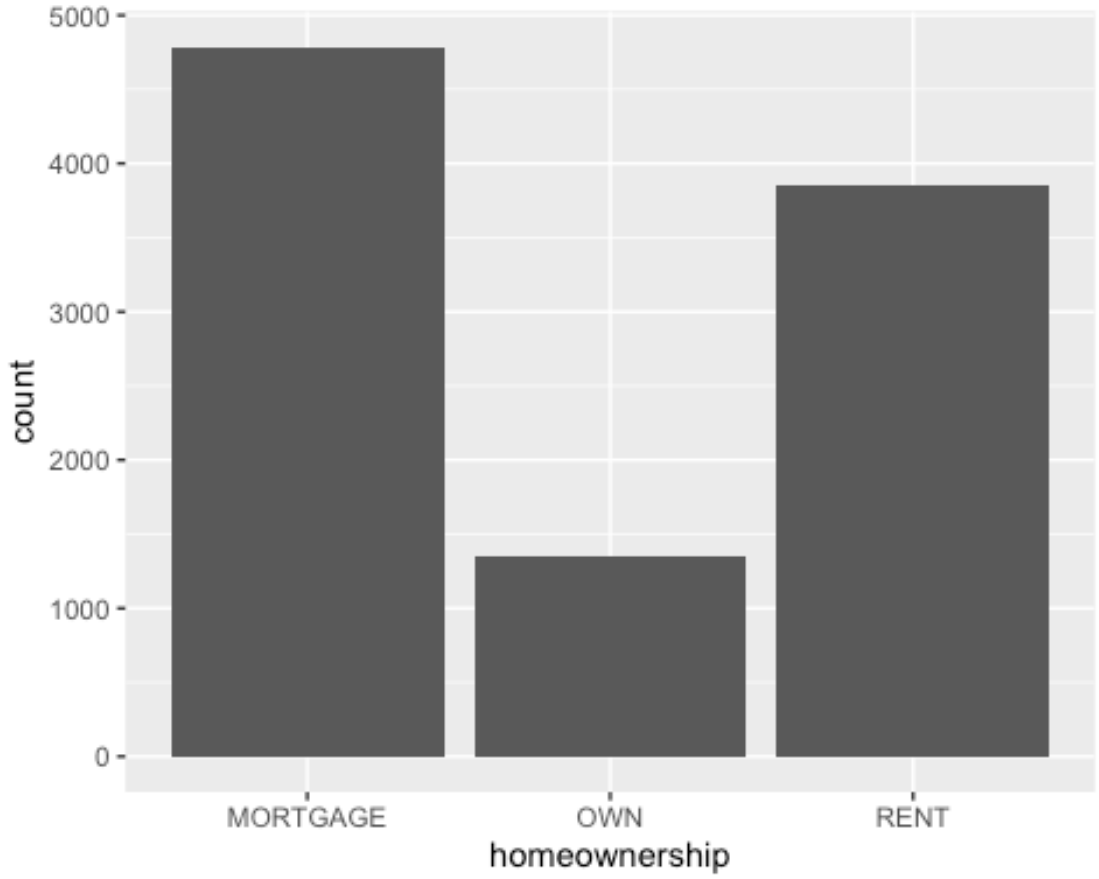
Hex plot 2:

```
ggplot(loans %>%
         filter(debt_to_income < 100),
aes(x = debt_to_income,
    y = interest_rate)) +
geom_hex()
```



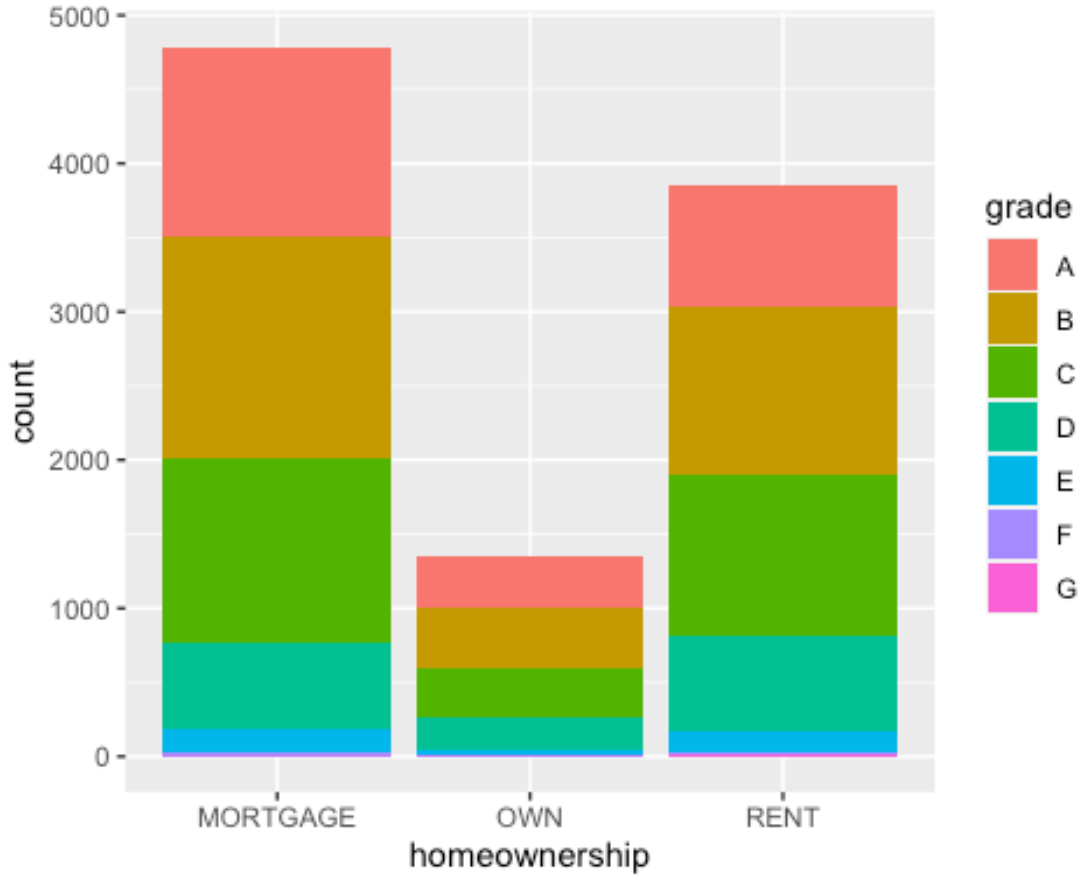
Bar plot

```
ggplot(loans, aes(x = homeownership)) +
geom_bar()
```

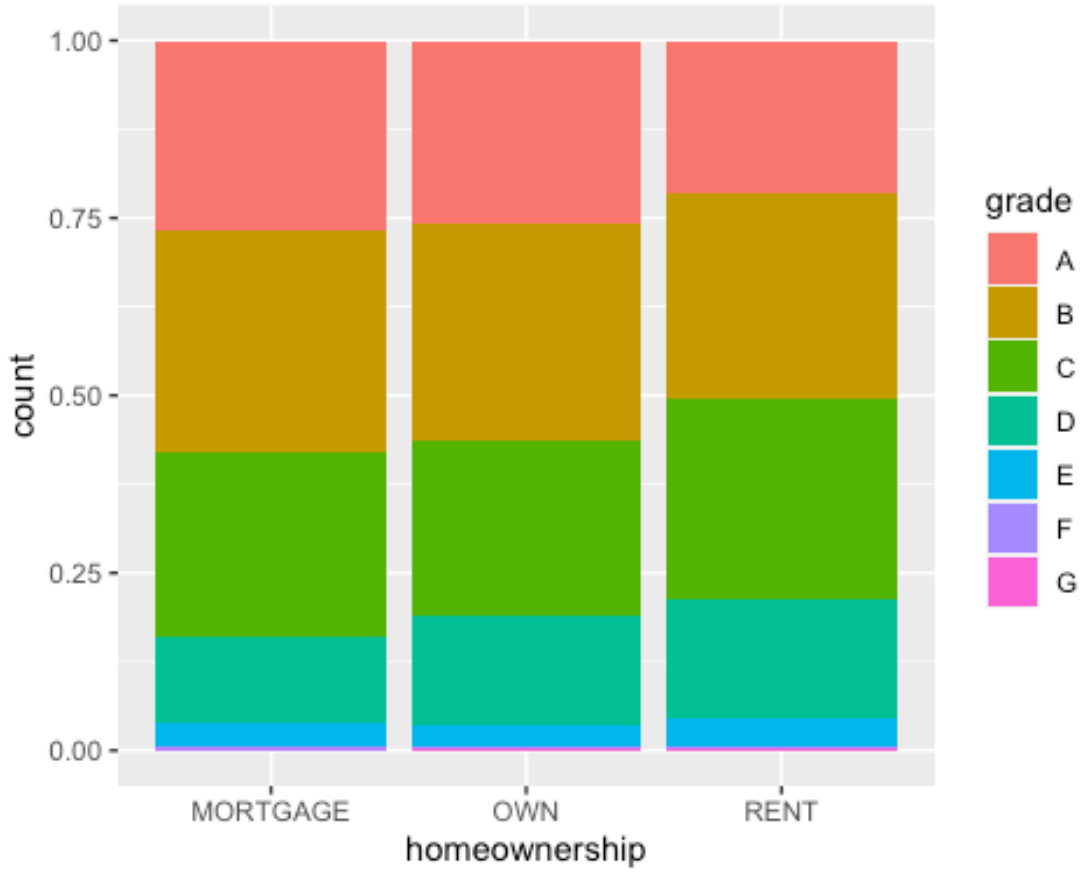


Segmented bar plot:

```
ggplot(loans,
       aes(x = homeownership,
           fill = grade)) +
geom_bar()
```




```
ggplot(loans, aes(x = homeownership,
                  fill = grade)) +
geom_bar(position = "fill")
```

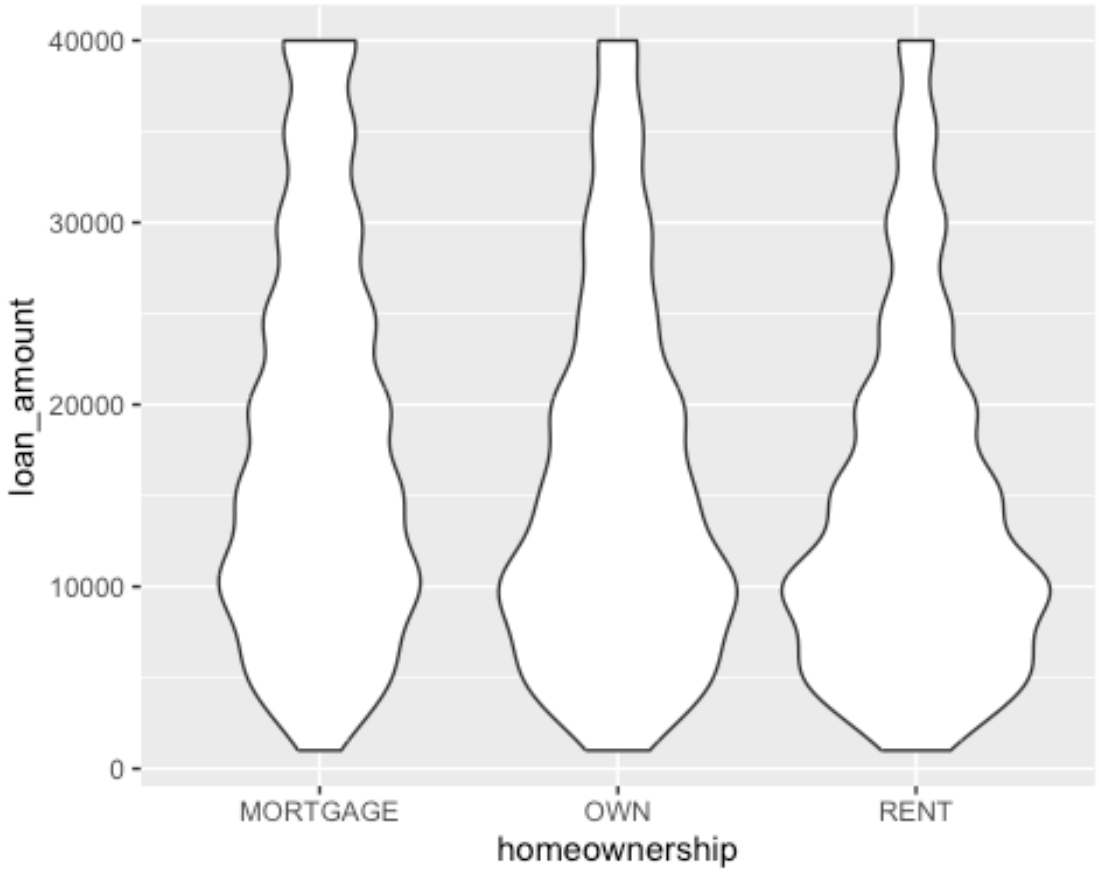


Customising Bar plots

```
ggplot(loans, aes(y = homeownership, fill = grade)) + geom_bar(position =
"fill") +
labs( x = "Proportion",
      y = "Homeownership", fill = "Grade",
      title = "Grades of Lending Club loans")
```

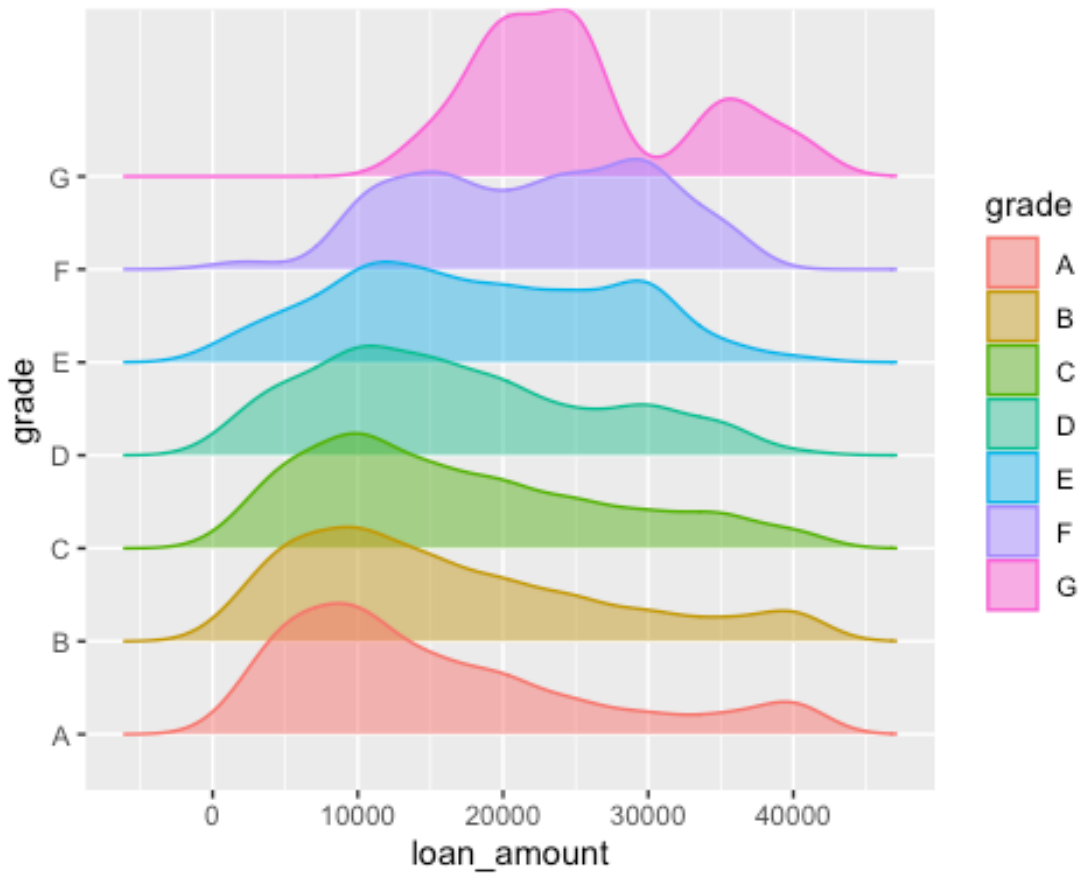
Violin plots

```
ggplot(loans,
       aes(x = homeownership, y = loan_amount)) +
geom_violin()
```



Ridge plots:

```
library(ggridges)
ggplot(loans, aes(x = loan_amount,
                  y = grade,
                  fill = grade,
                  color = grade)) +
geom_density_ridges(alpha = 0.5)

## Picking joint bandwidth of 2360
```


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