Week-7: Code-along

NM2207: Computational Media Literacy- Tang Ching Xian

2 October 2023

Palmer Penguins Dataset (Slide #6)

```
# Load libraries
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
```

```
# Install package
#install.packages("palmerpenguins")
library(palmerpenguins)

# See the structure of the penguins dataset
glimpse(penguins)
```

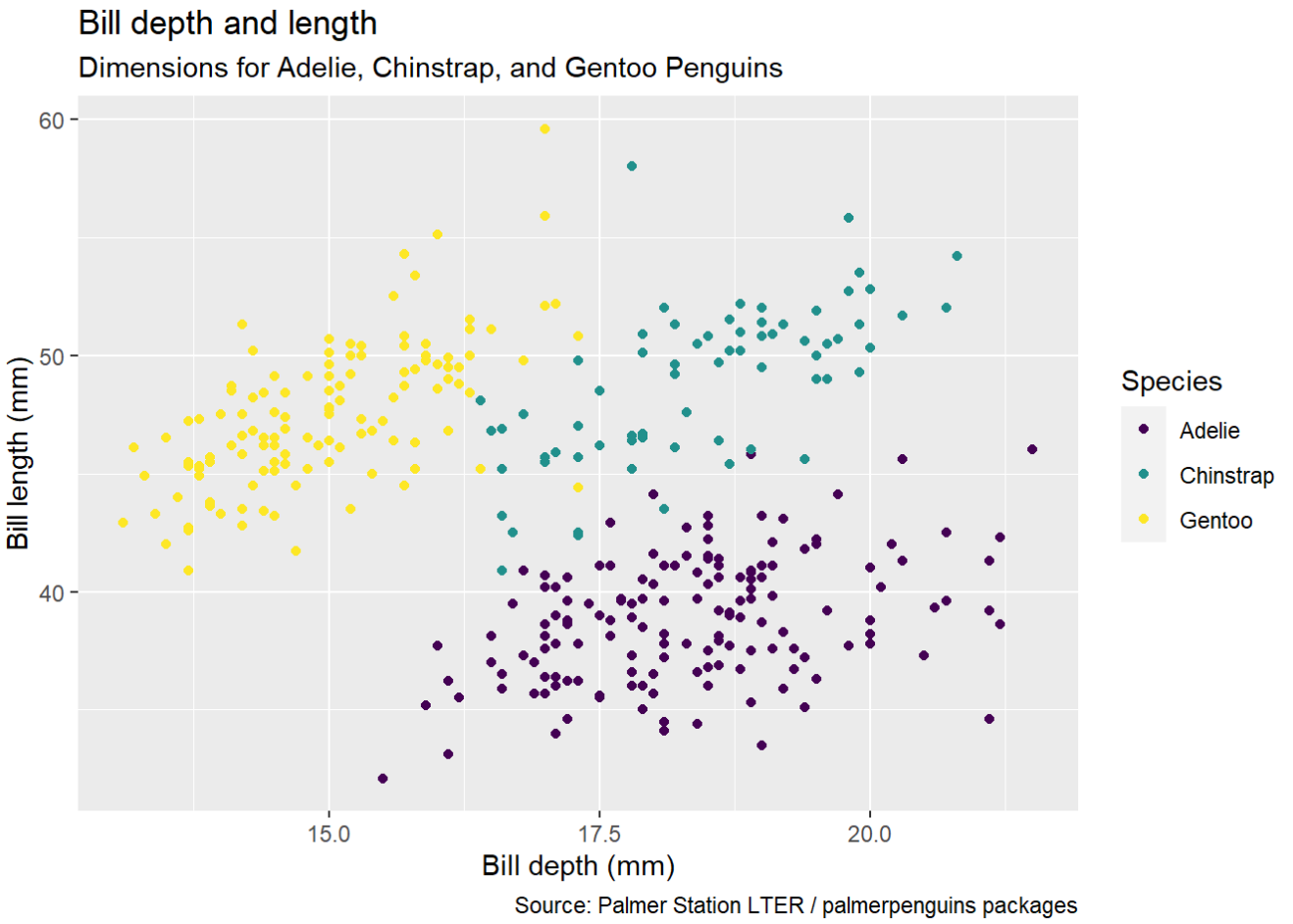
```
## Rows: 344
## Columns: 8
## $ species           <fct> Adelie, Adelie, Adelie, Adelie, Adelie, Adelie, Adel…
## $ island            <fct> Torgersen, Torgersen, Torgersen, Torgersen, Torgerse…
## $ bill_length_mm    <dbl> 39.1, 39.5, 40.3, NA, 36.7, 39.3, 38.9, 39.2, 34.1, …
## $ bill_depth_mm     <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 (Slide #8)

```
ggplot(data = penguins)
```

```
# Create a ggplot object using the penguins dataset
ggplot(data = penguins,
       mapping = aes(x = bill_depth_mm,
                     y = bill_length_mm,
                     colour = species)) +

# Add points to represent the data
  geom_point() +

# Add labels and titles to enhance readability
  labs(title = "Bill depth and length",
       subtitle = "Dimensions for Adelie, Chinstrap, and Gentoo Penguins",
       x = "Bill depth (mm)",
       y = "Bill length (mm)",
       colour = "Species",  # Label for the color legend
       caption = "Source: Palmer Station LTER / palmerpenguins packages") +  # Caption wit
h data source

# Use the Viridis color scale for the species
scale_colour_viridis_d()
```

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

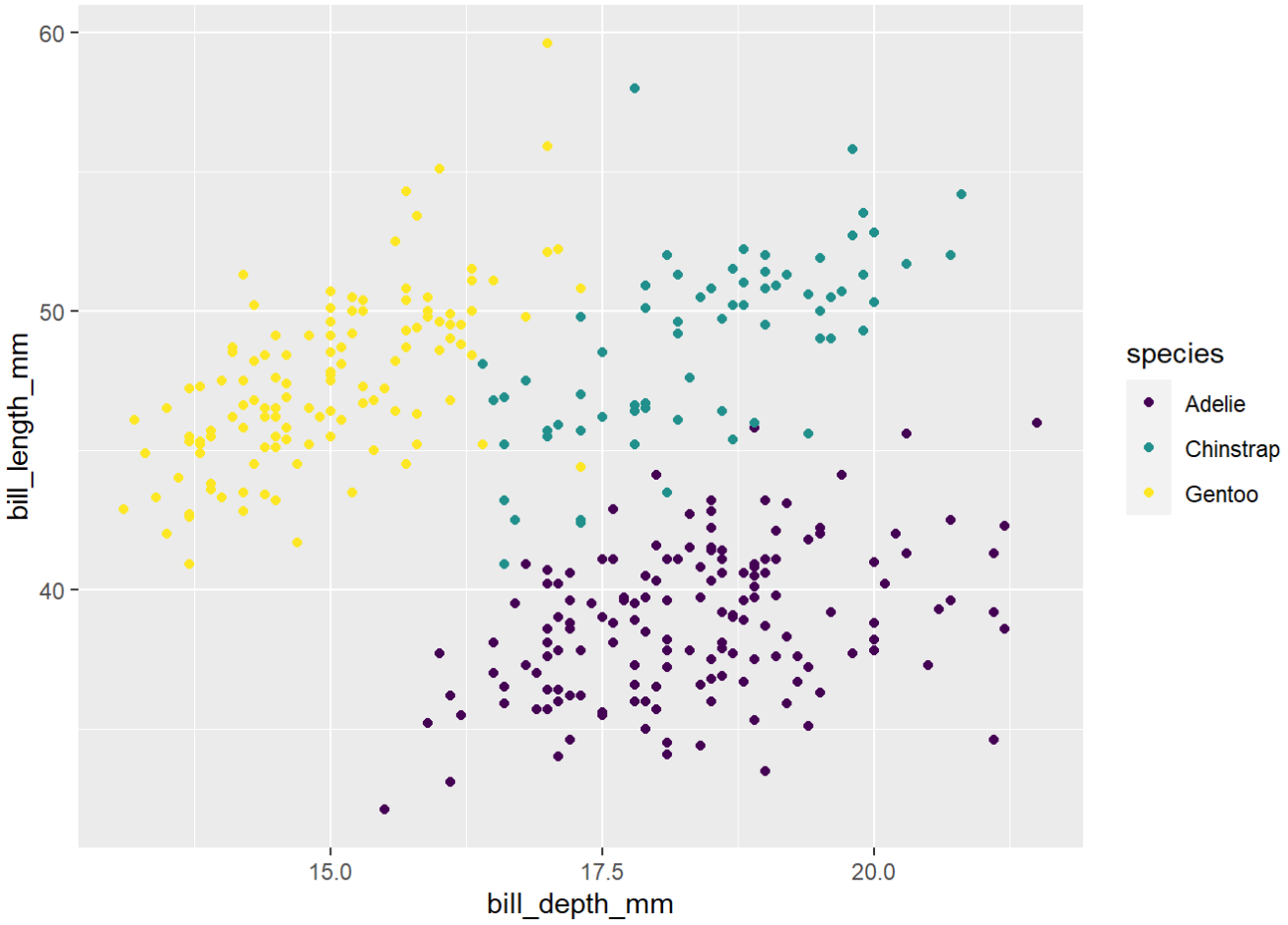


```
# Omit the names of the first two argument when building plot with ggplot()
#ggplot(penguins) + # Data layer
#aes(x = bill_depth_mm,
#y = bill_length_mm,
#colour = species) + # Aesthetics layer
#geom_point() + # Geometric layer
#scale_colour_viridis_d()
```

Change shape

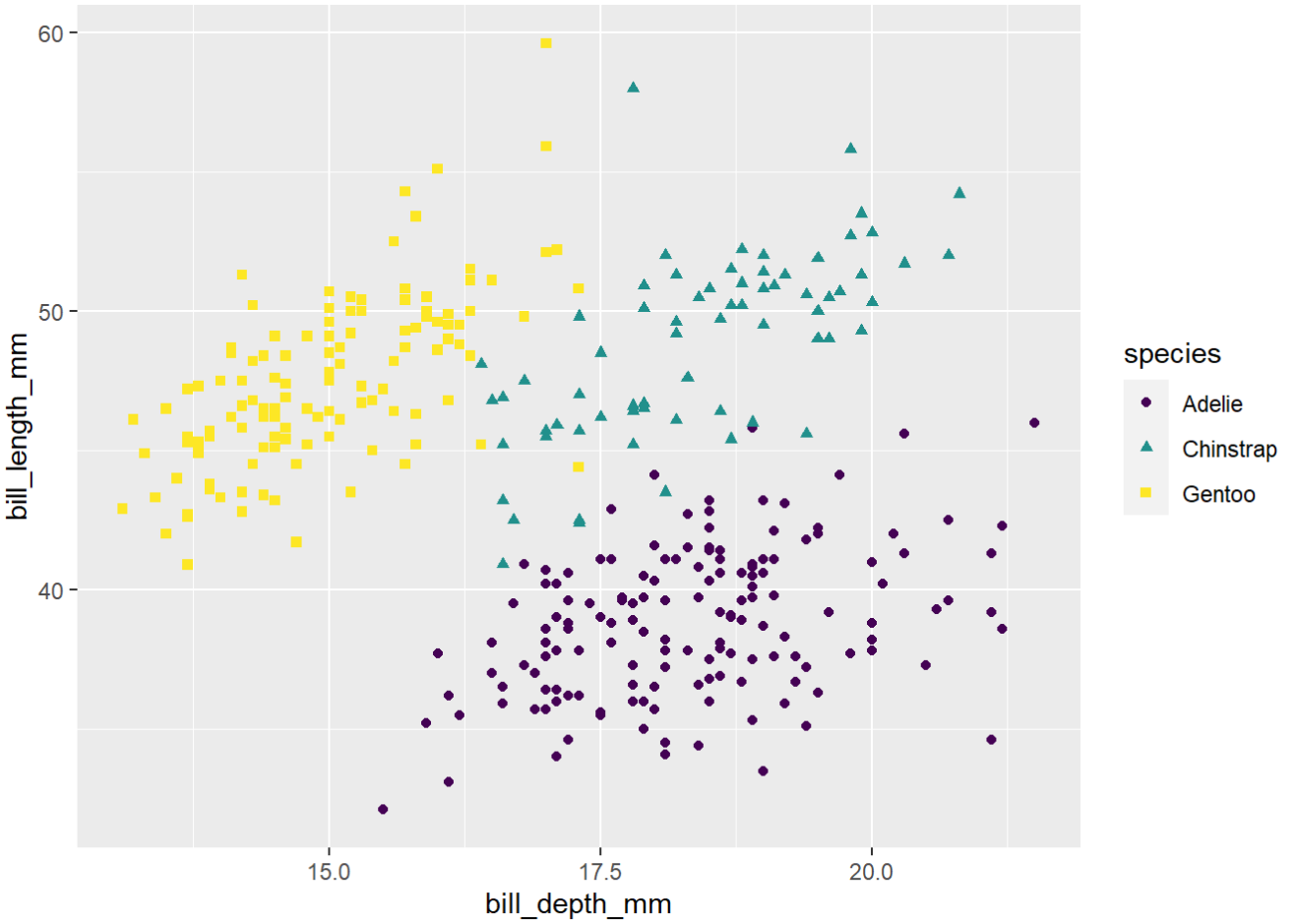
```
library(palmerpenguins)
ggplot(penguins,
       aes(x = bill_depth_mm,
           y = bill_length_mm,
           colour = species,
)) +
geom_point() + scale_colour_viridis_d()
```

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



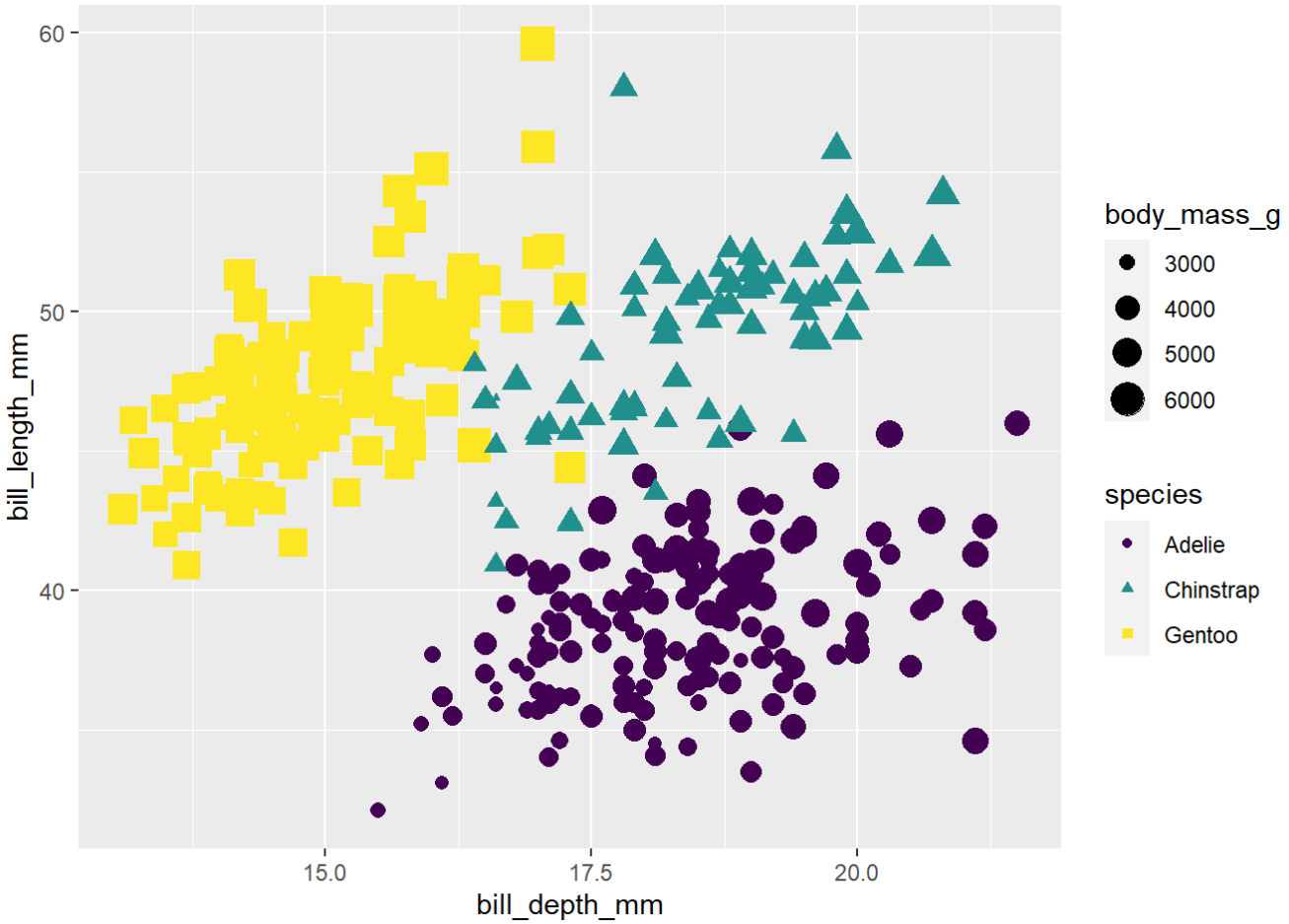
```
ggplot(penguins,
       aes(x = bill_depth_mm,
           y = bill_length_mm,
           colour = species,
           shape = species)) +
  geom_point() +
  scale_colour_viridis_d()
```

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



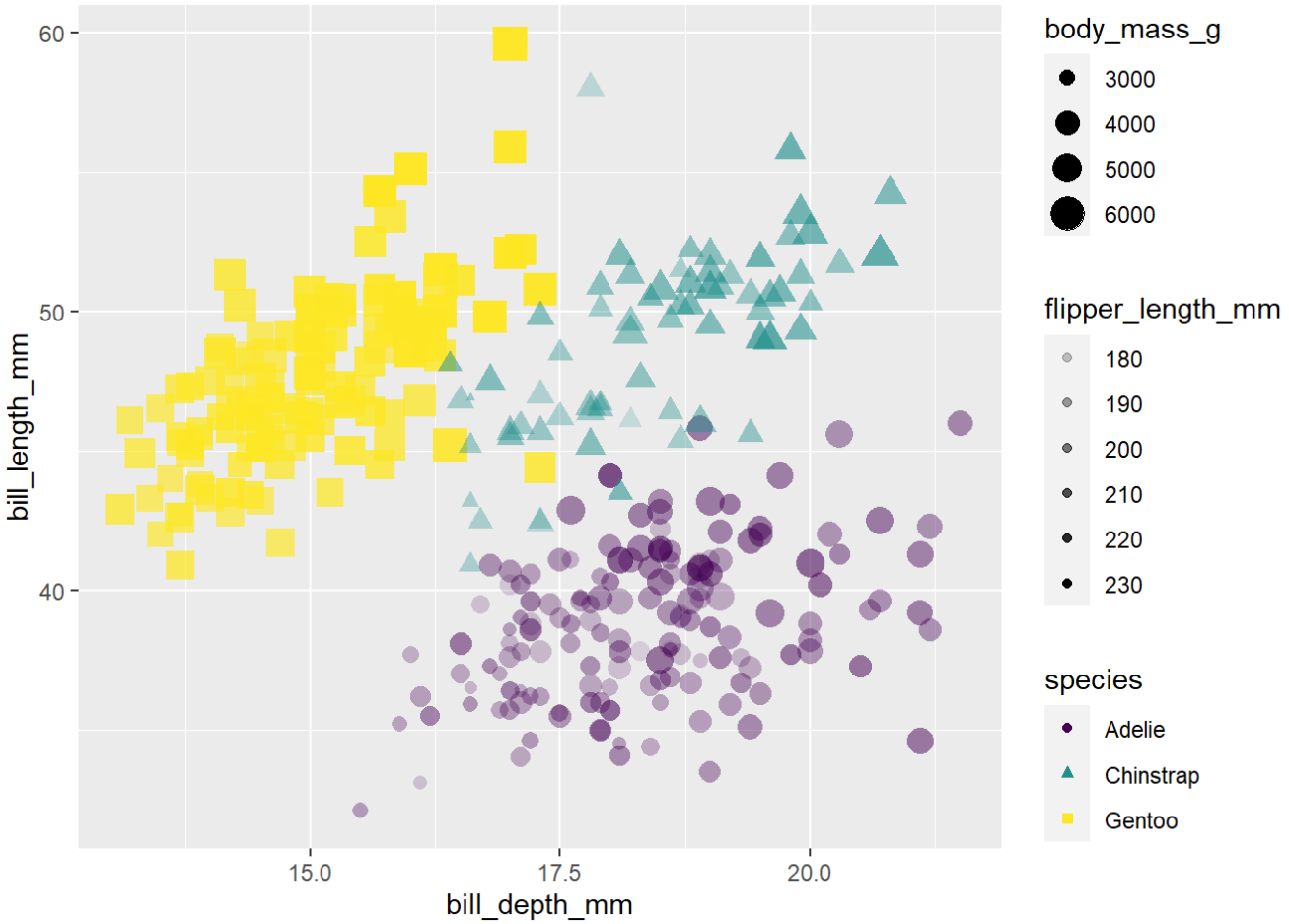

```
ggplot(penguins,
       aes(x = bill_depth_mm,
           y = bill_length_mm,
           colour = species,
           shape = species,
           size = body_mass_g)) +
  geom_point() +
  scale_colour_viridis_d()
```

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




```
# Change shape of species
ggplot(penguins,
       aes(x = bill_depth_mm,
           y = bill_length_mm,
           colour = species,
           shape = species,    # Distinguish species by shape
           size = body_mass_g, # Size points by body mass
           alpha = flipper_length_mm)) +  # Adjust transparency by flipper length

# Add points to represent the data
  geom_point() +

# Use the Viridis color scale for the species
  scale_colour_viridis_d()
```

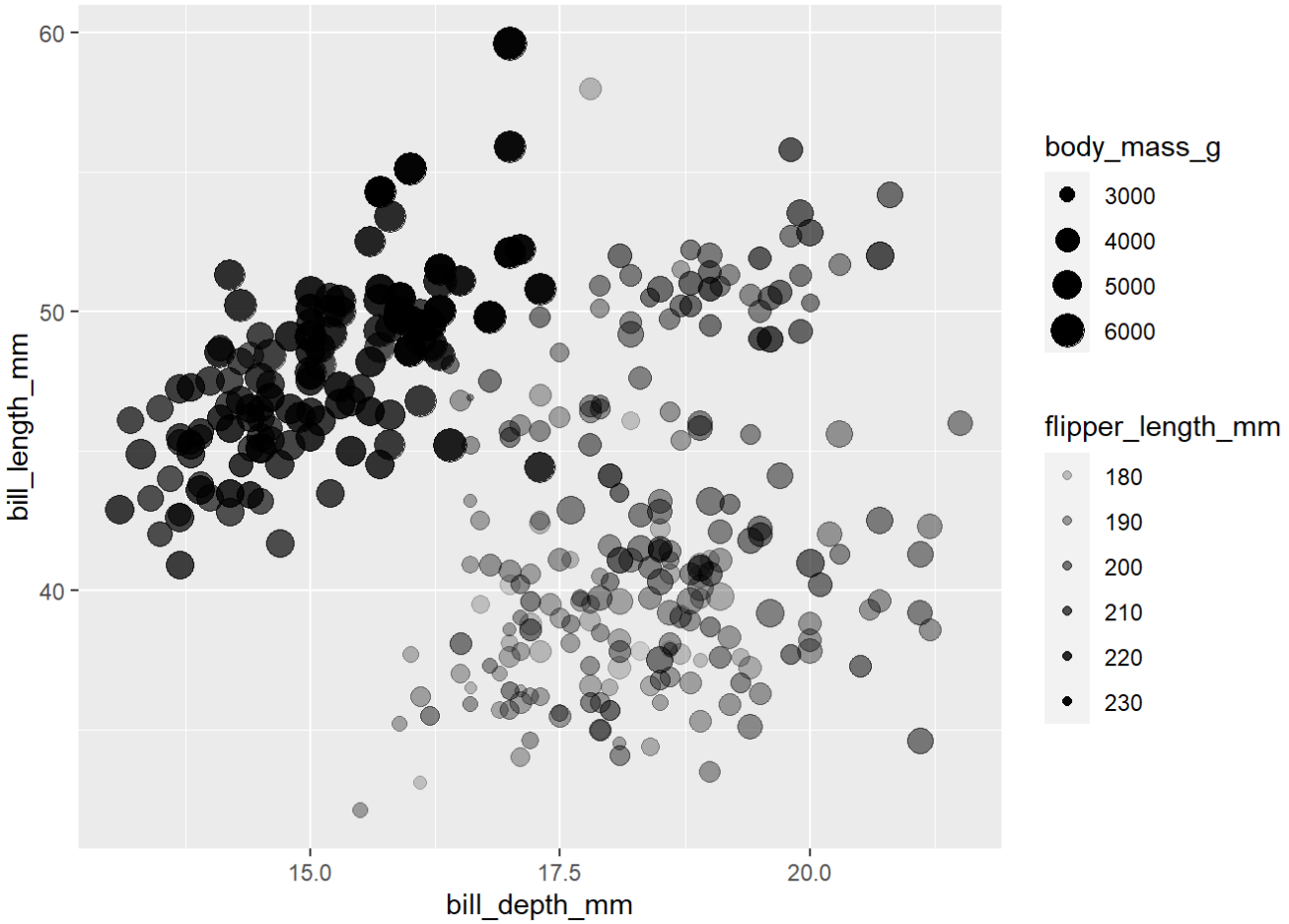
```
## Warning: Removed 2 rows containing missing values (`geom_point()`).
```



Mapping verus Setting (Slide #28)

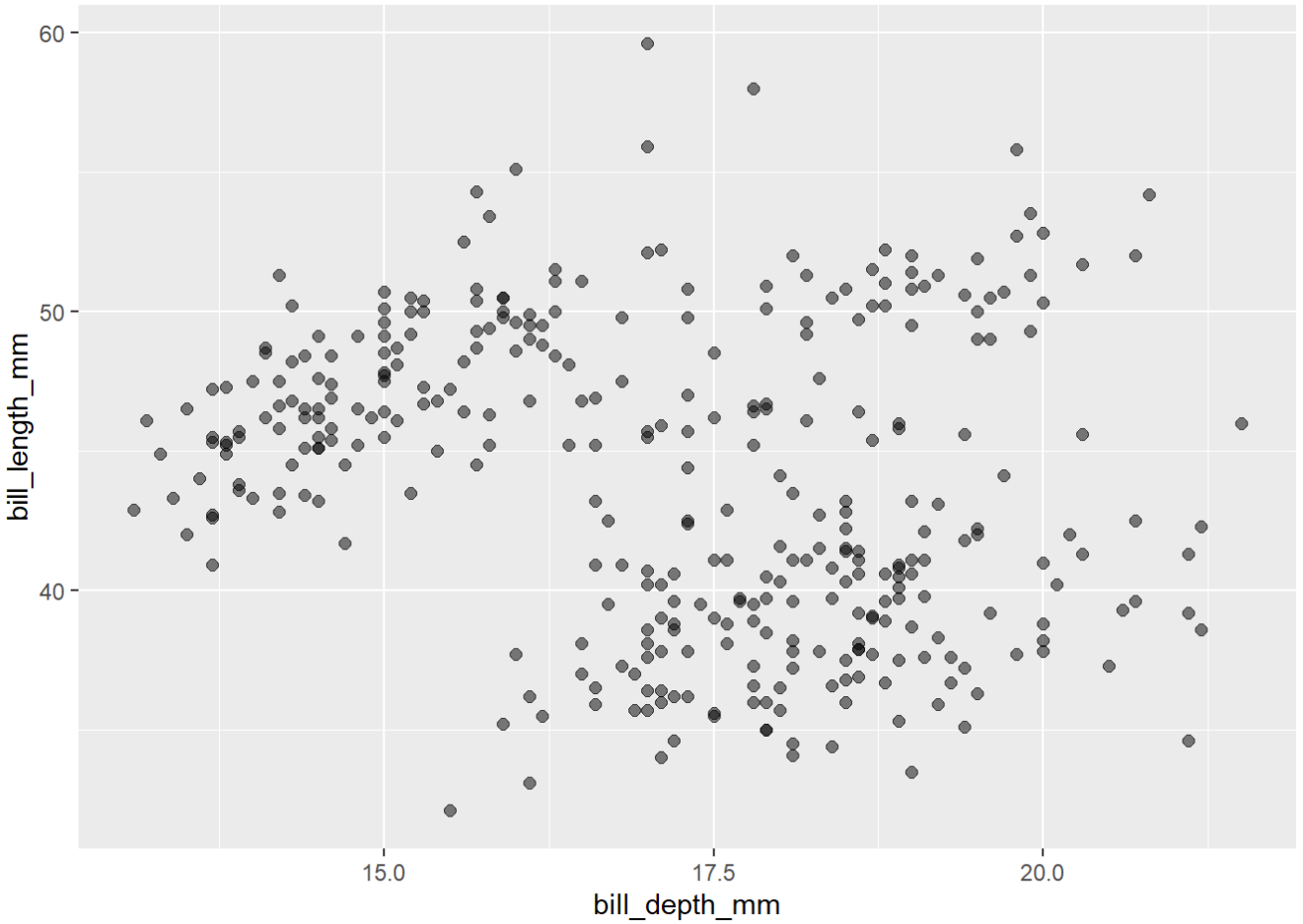
```
# Mapping (using aes())
ggplot(penguins,
aes(x = bill_depth_mm,
    y = bill_length_mm,
    size = body_mass_g,
    alpha = flipper_length_mm)) +
geom_point()
```

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




```
##note: values of x, y, size, and alpha are dynamically determined based on the variables specified in aes(). This is useful when creating a plot where these aesthetics vary across different levels of your data.

#Setting (directly within geom or ggplot() call)
ggplot(penguins,
aes(x = bill_depth_mm,
    y = bill_length_mm)) +
geom_point(size = 2, alpha = 0.5)
```

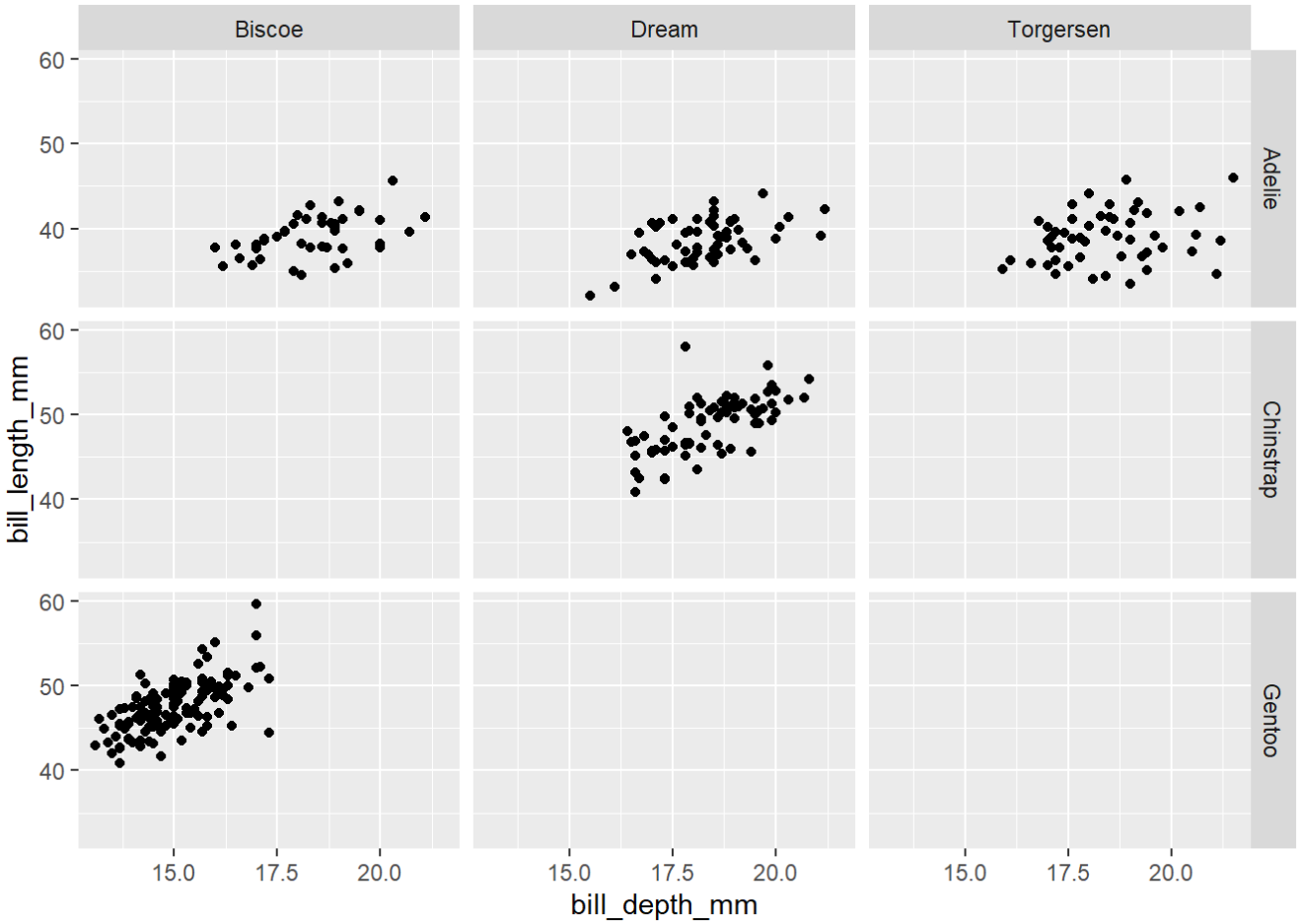
```
## Warning: Removed 2 rows containing missing values (`geom_point()`).
```




```
##note: The aesthetics (x and y) are mapped globally using aes() at the beginning of the g
gplot call, but size and alpha are constant for all points.
```

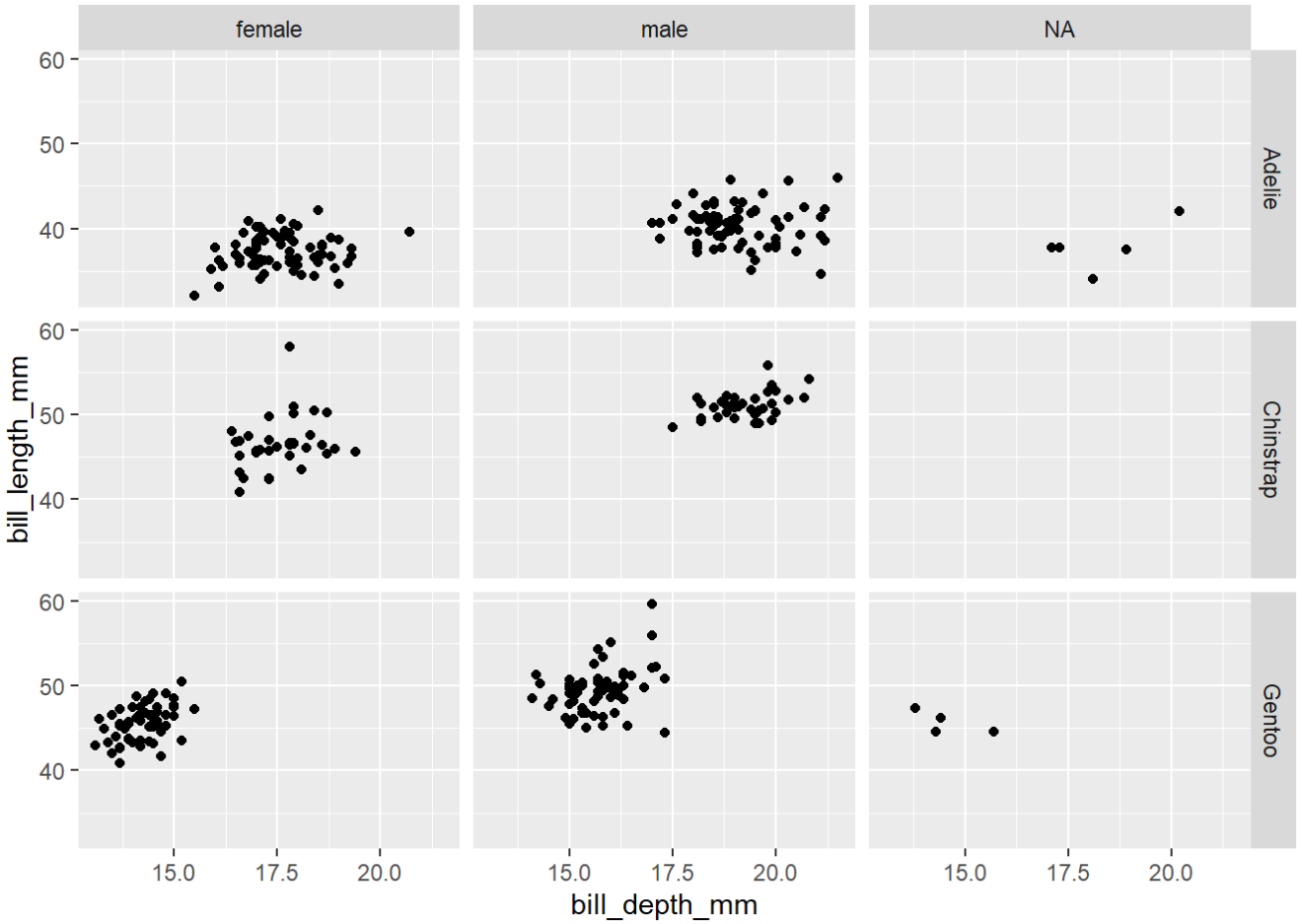
```
# Create a ggplot object using the penguins dataset
ggplot(penguins,
aes(x = bill_depth_mm,
    y = bill_length_mm)) +
geom_point() +
# Create facets (small multiples) based on species and island
facet_grid(species ~ island)
```

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



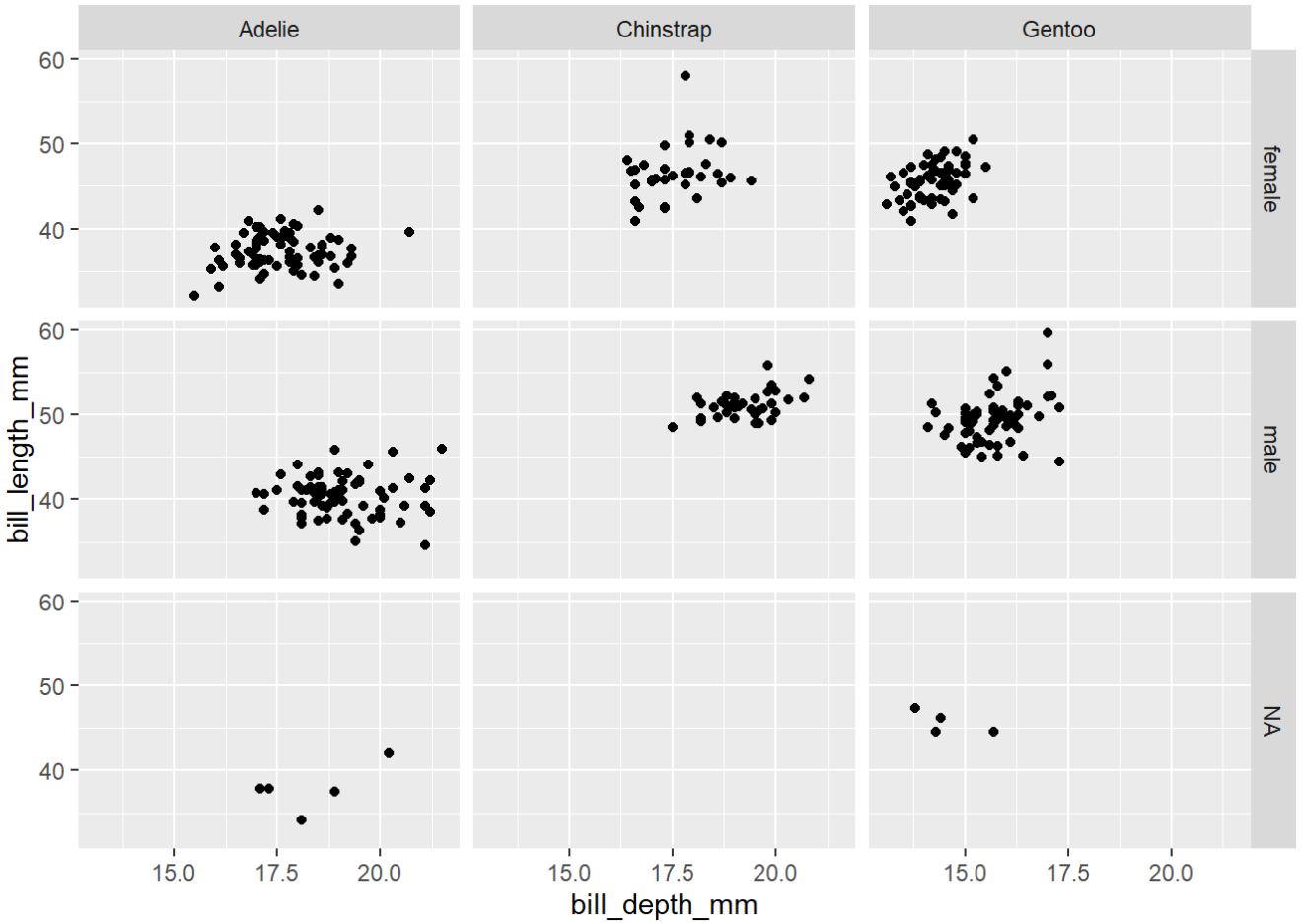

```
##note: faceting useful for exploring conditional relationship and large data, generate sm
aller plots that display different subsets of the data
ggplot(penguins) +
aes(x = bill_depth_mm,
    y = bill_length_mm) +
geom_point() +
# Create facets (small multiples) based on species and sex
facet_grid(species ~ sex)
```

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



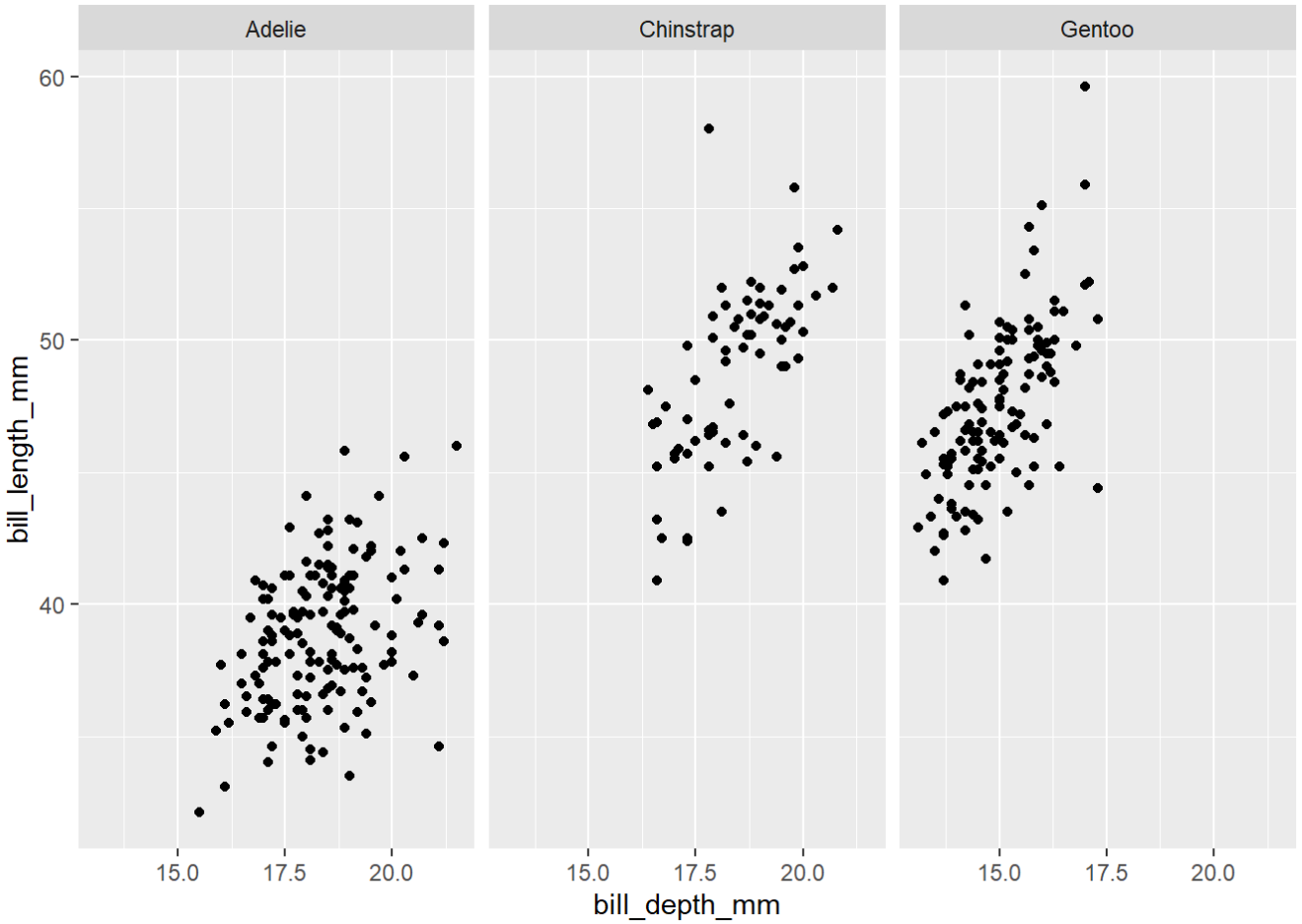

```
ggplot(penguins) +
aes(x = bill_depth_mm,
    y = bill_length_mm) +
geom_point() +
# Create facets (small multiples) based on sex and species, order matters
facet_grid(sex ~ species)
```

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



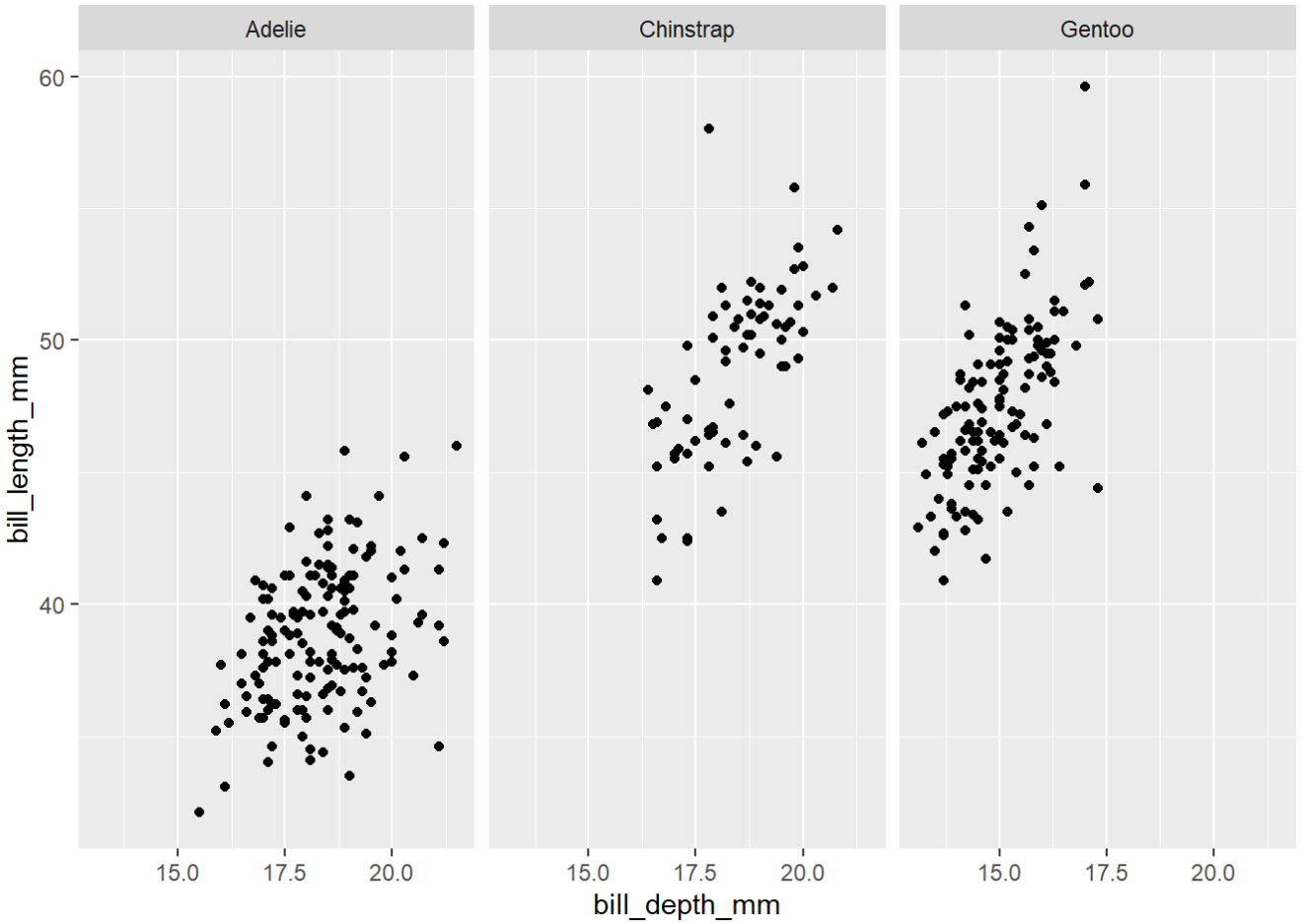

```
ggplot(penguins) +
aes(x = bill_depth_mm,
    y = bill_length_mm) +
geom_point() +
# Create facets (small multiples) based on species only.
facet_grid(.~ species)
```

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



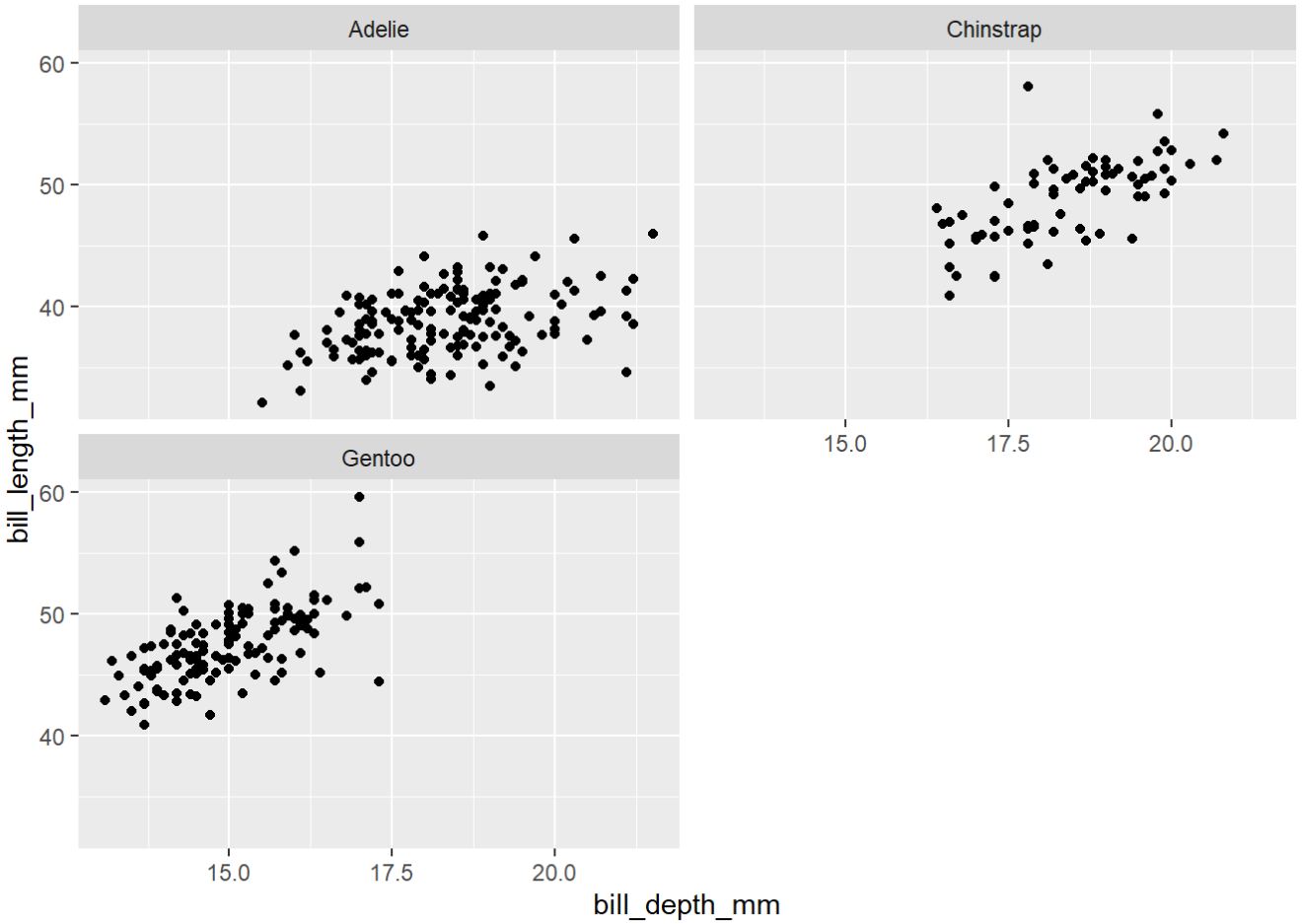

```
#verus
ggplot(penguins) +
aes(x = bill_depth_mm,
    y = bill_length_mm) +
geom_point() +
# Create facets (small multiples) based on species only
facet_wrap(~ species)
```

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



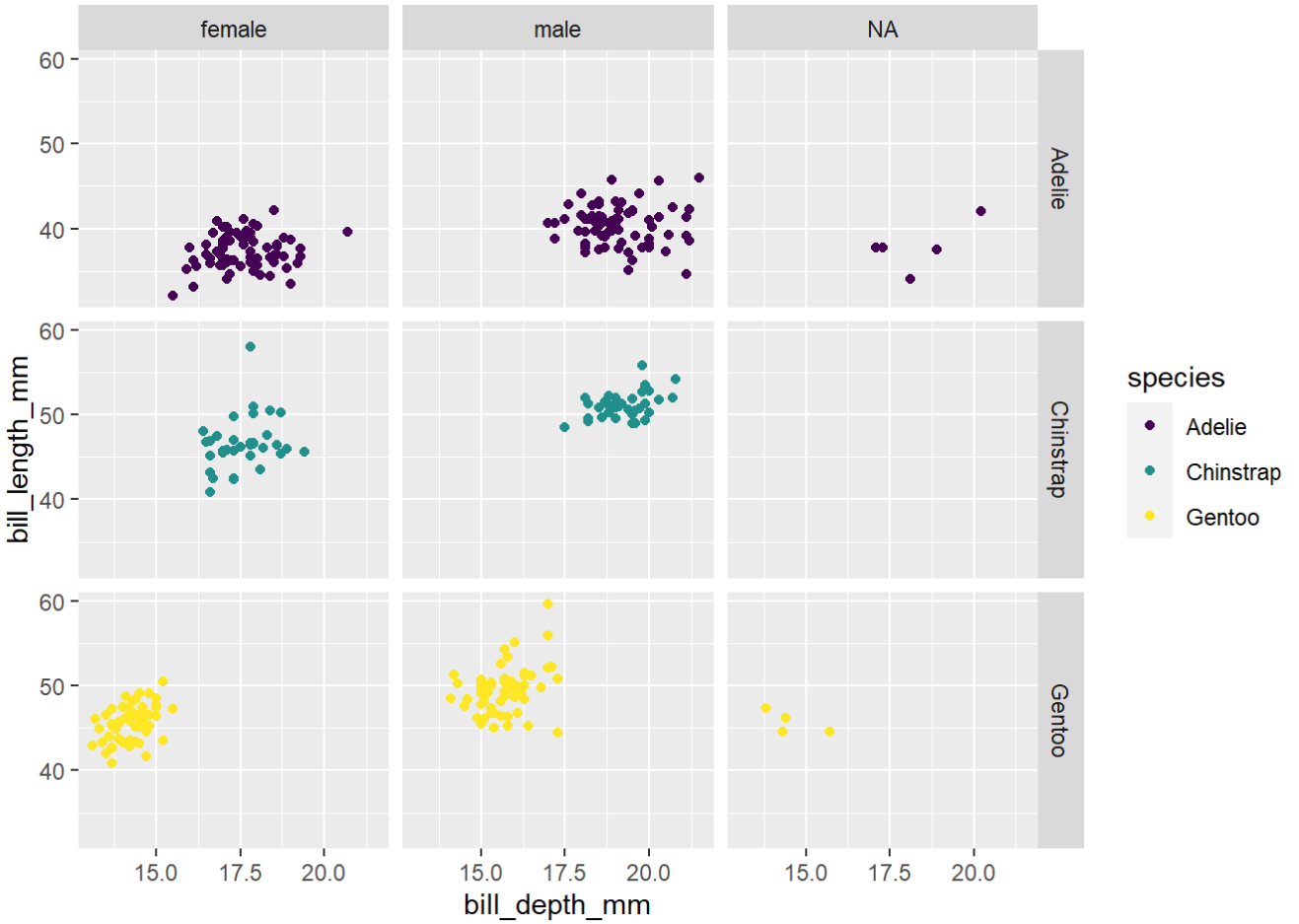

```
##note: facet_grid can create a grid with both rows and columns, while facet_wrap typicall
y arranges them in a one-dimensional ribbon.

ggplot(penguins, aes(x = bill_depth_mm, y = bill_length_mm)) +
  geom_point() +

# Facet the plot by species, arranging them in 2 columns
facet_wrap(~ species, ncol = 2)
```

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



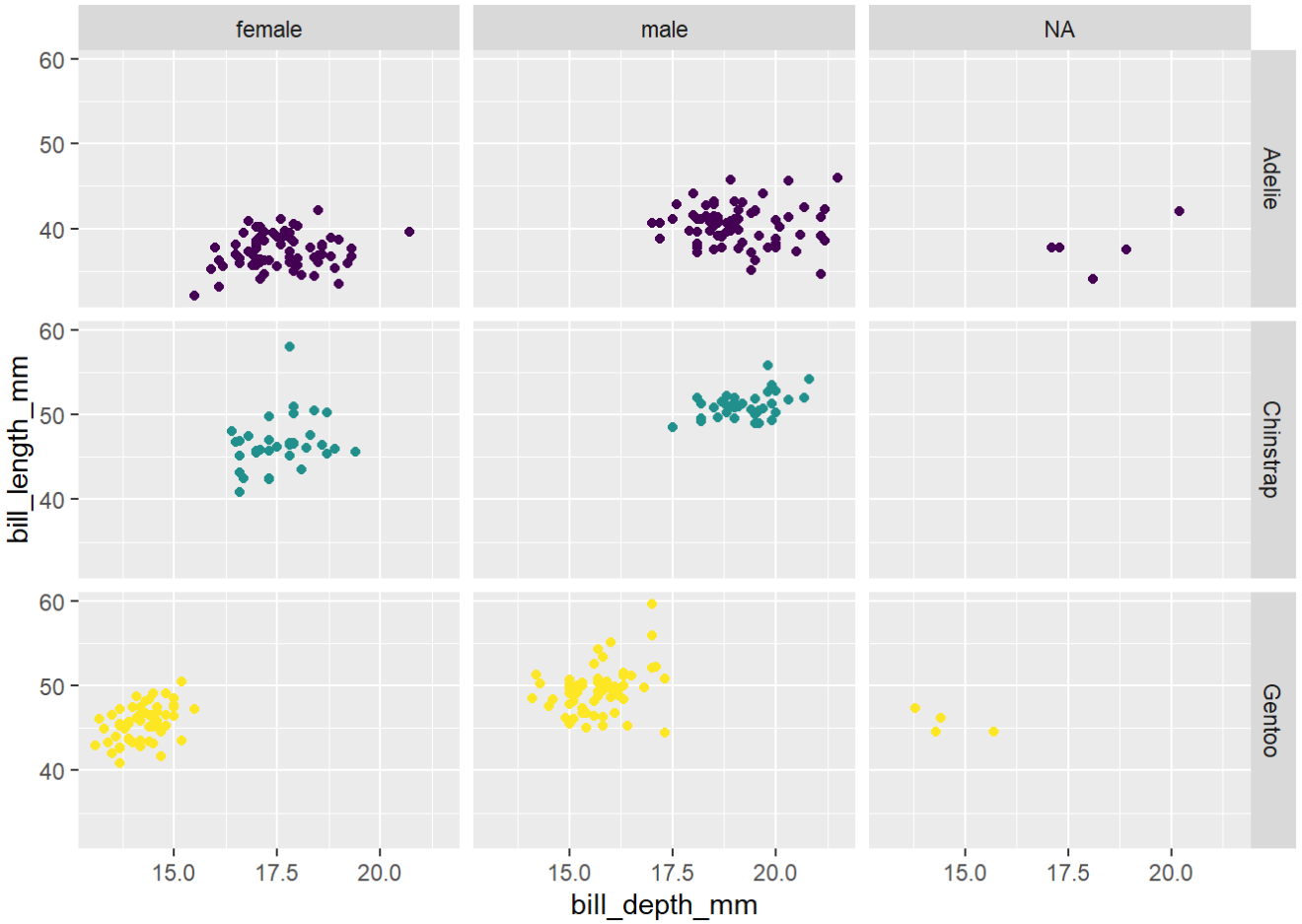

```
ggplot(penguins, aes(x = bill_depth_mm, y = bill_length_mm, color = species)) +
  geom_point() +
  facet_grid(species ~ sex) +
  scale_color_viridis_d()
```

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




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

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



Visualise numeric varibale (Slide #40)

```
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…
```

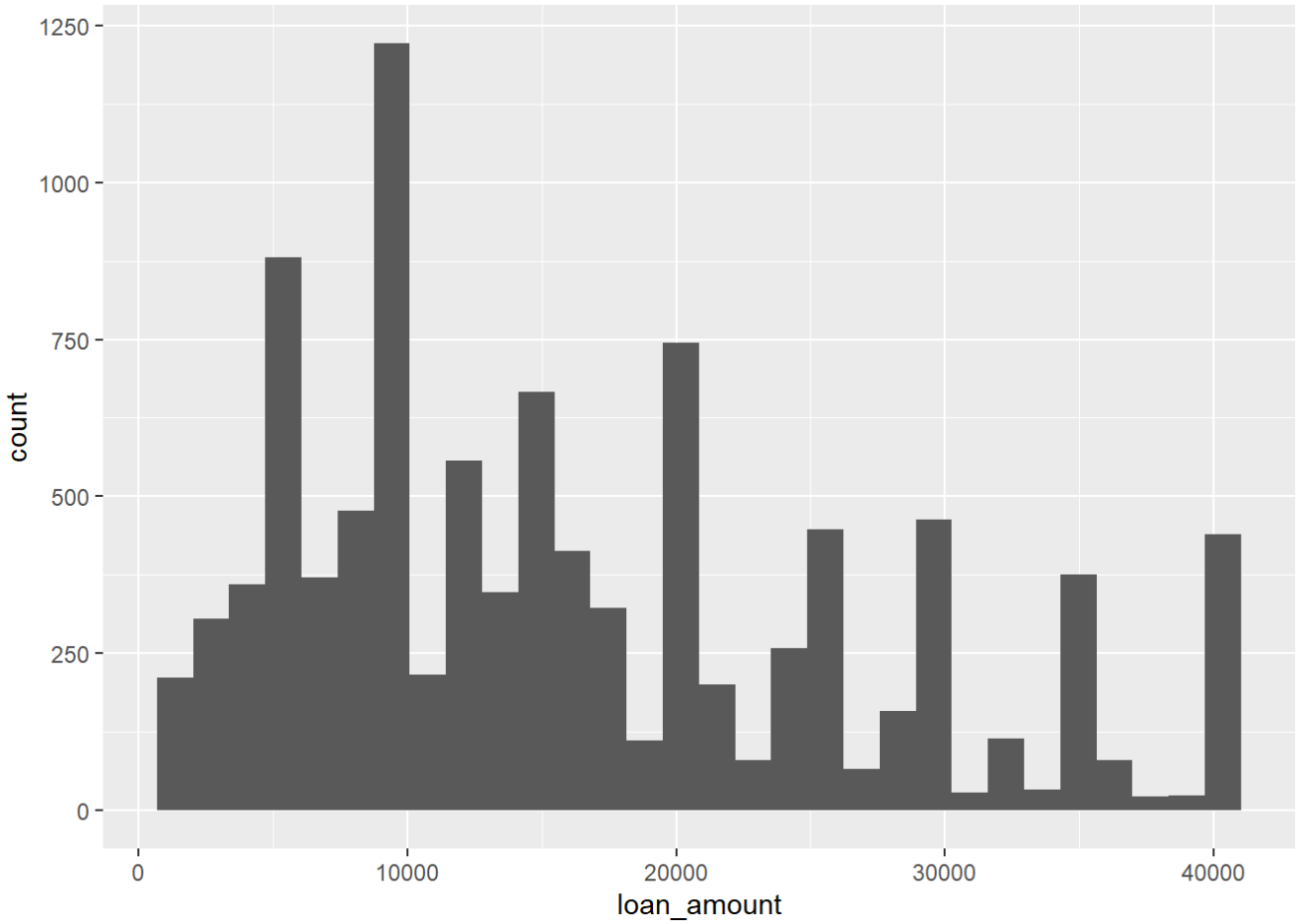
```
# Select specific columns from the loans_full_schema dataset
loans <- loans_full_schema %>%
  select(
    loan_amount,
    interest_rate,
    term,
    grade,
    state,
    annual_income,
    homeownership,
    debt_to_income
  )

# Display a summary of the loans dataset
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…
```

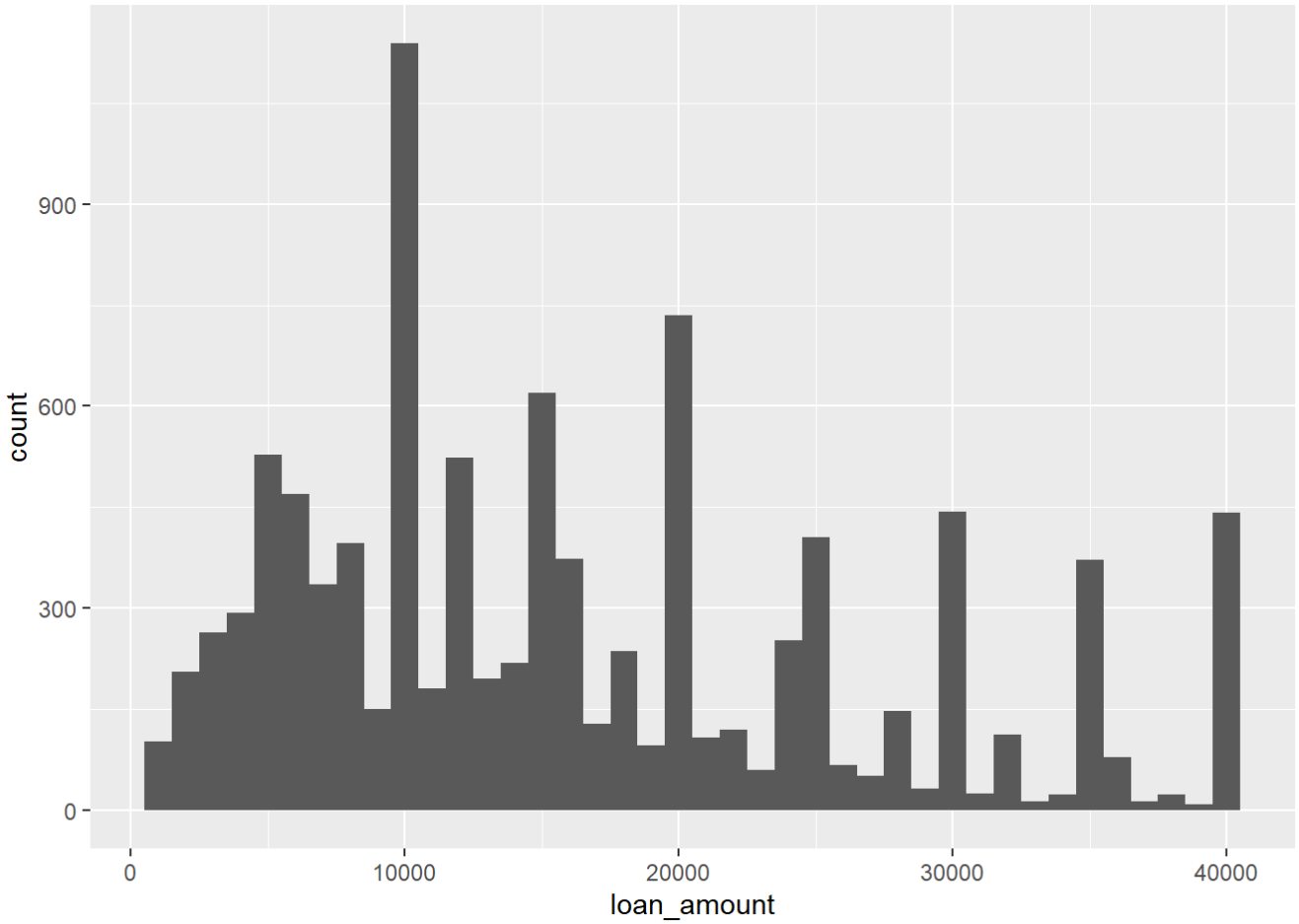
Visualise using Histogram (Slide #46)

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

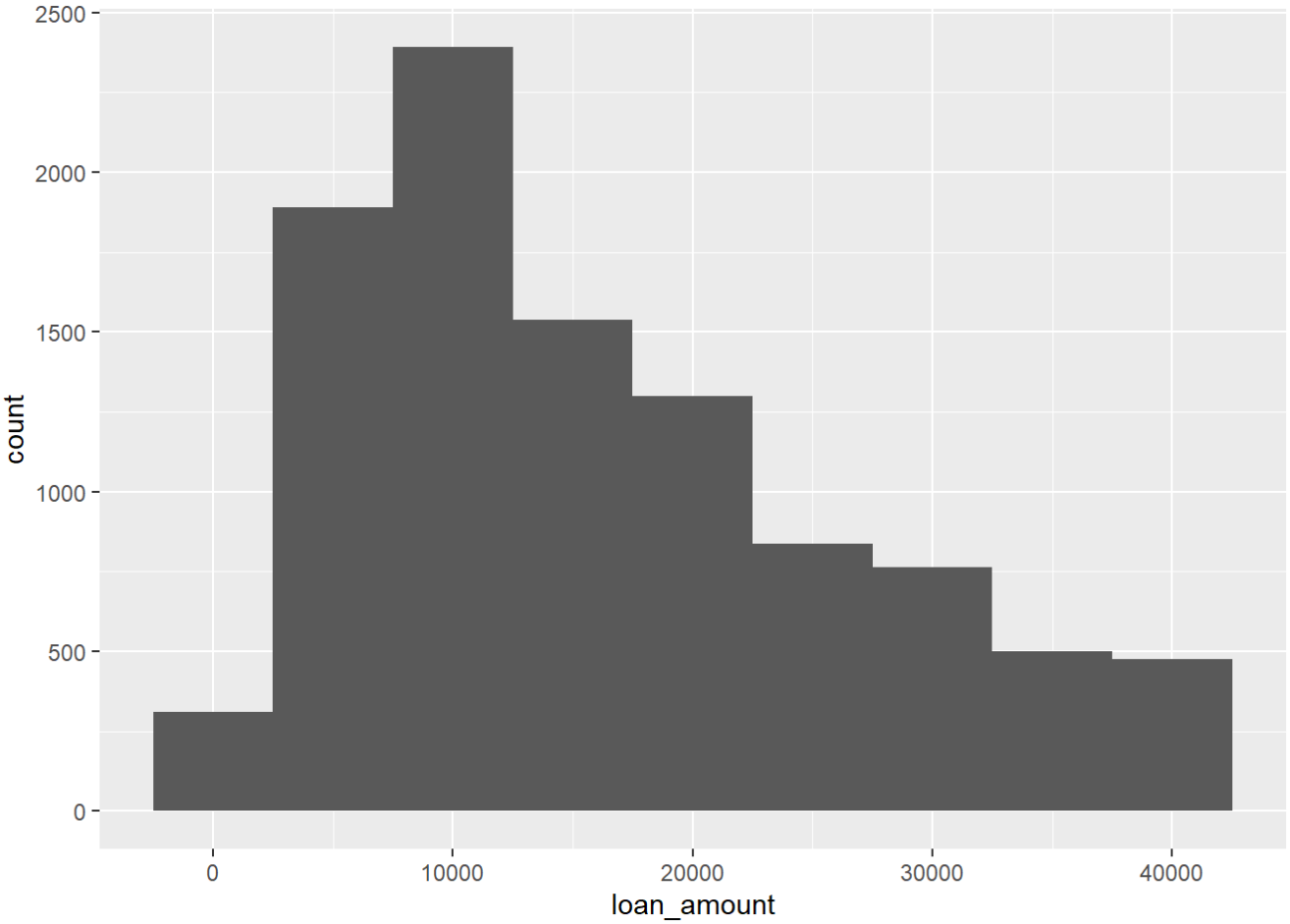
```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```



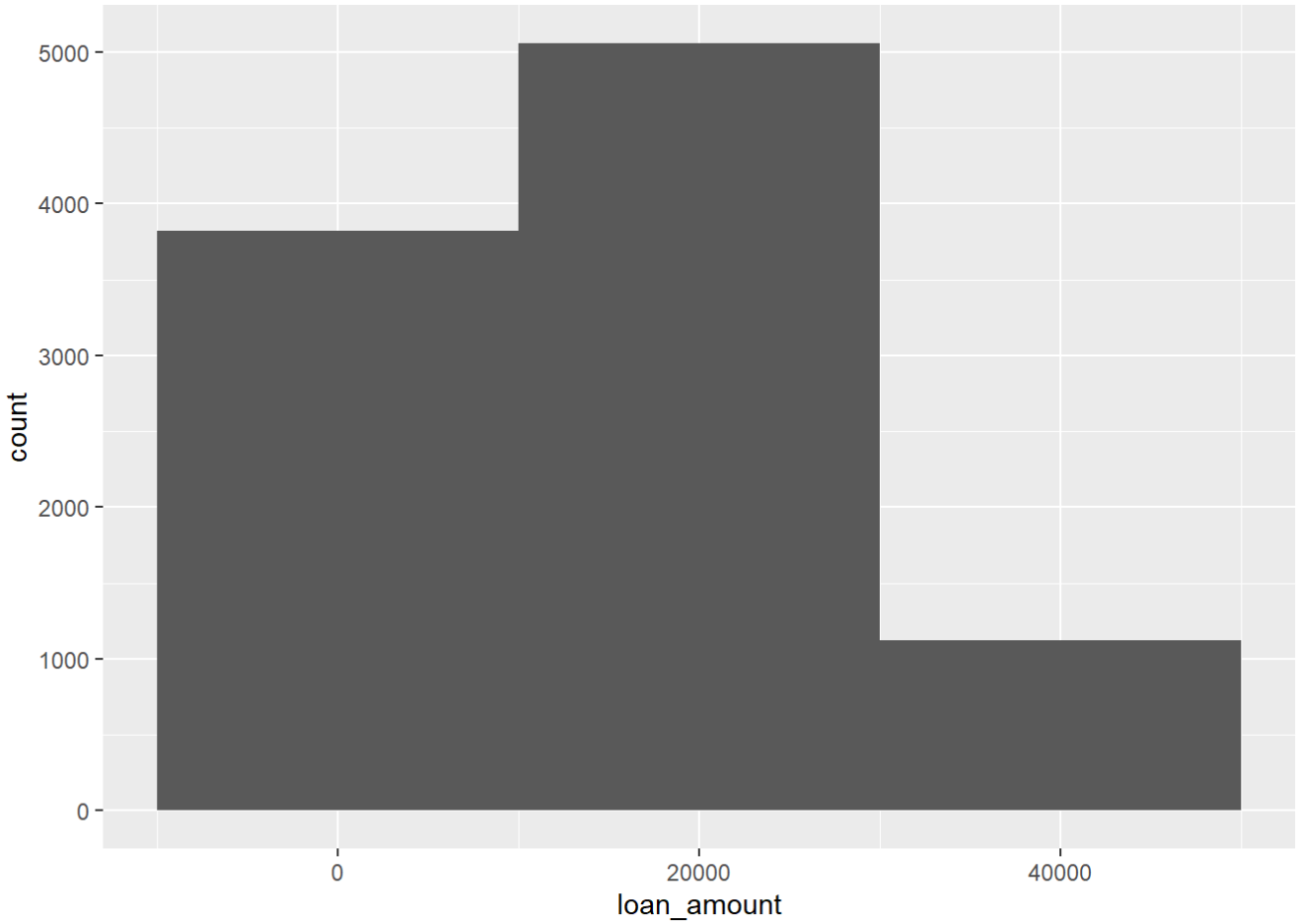

```
# binwidth = 1000
ggplot(loans, aes(x = loan_amount)) +
geom_histogram(binwidth = 1000)
```




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

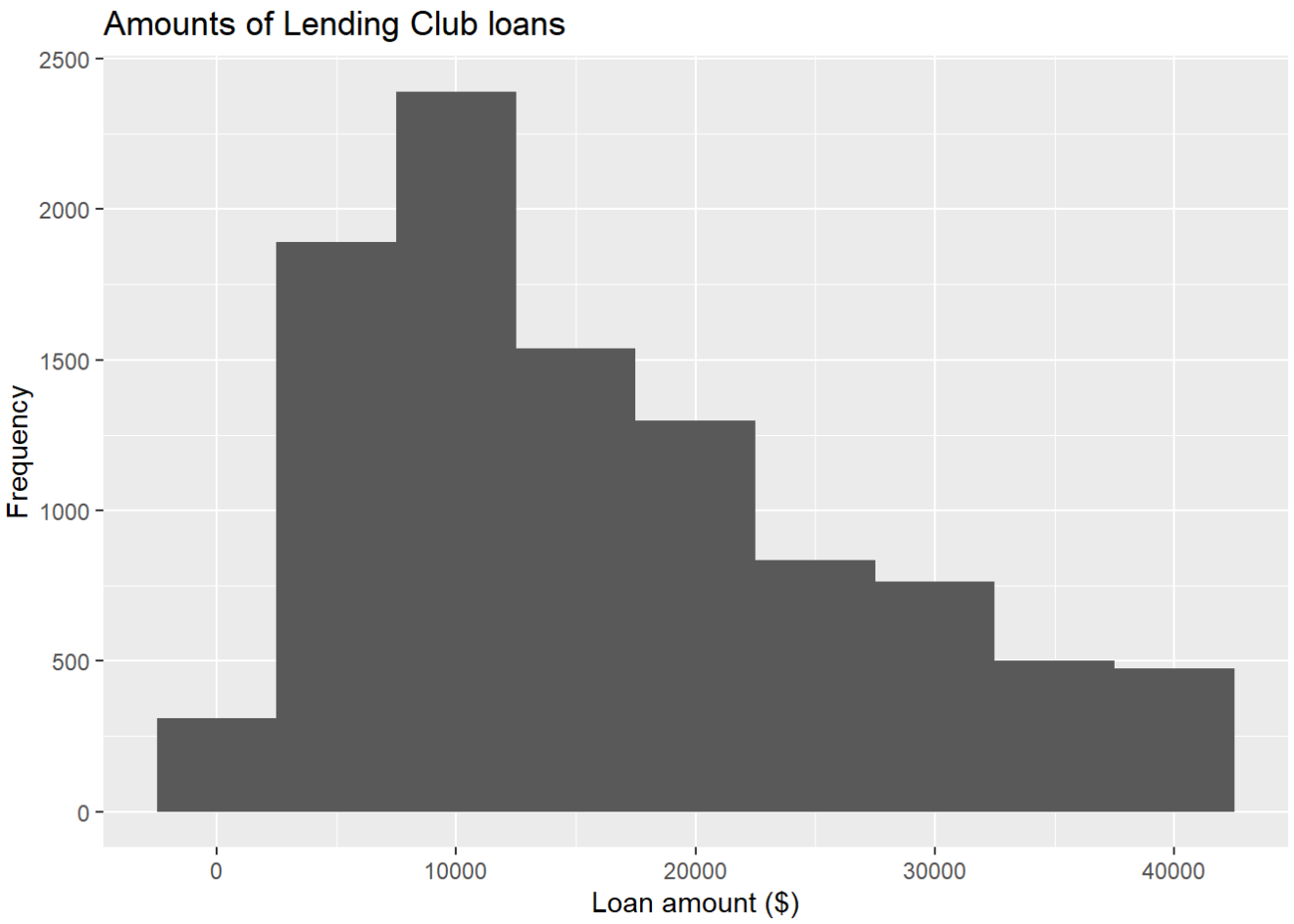



```
# binwidth = 20000
ggplot(loans, aes(x = loan_amount)) +
geom_histogram(binwidth = 20000)
```

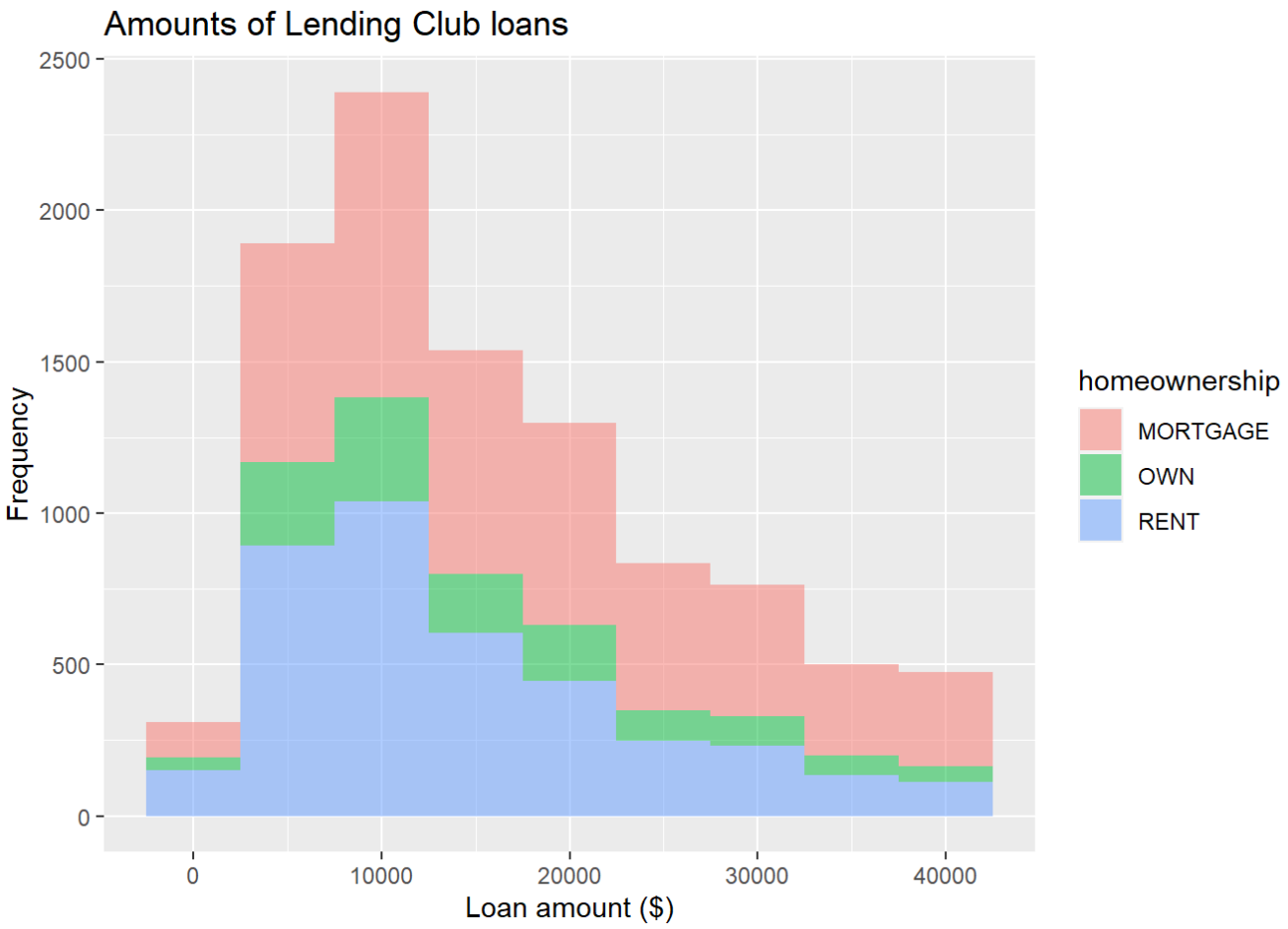


Customise Historgram (Slide #50)

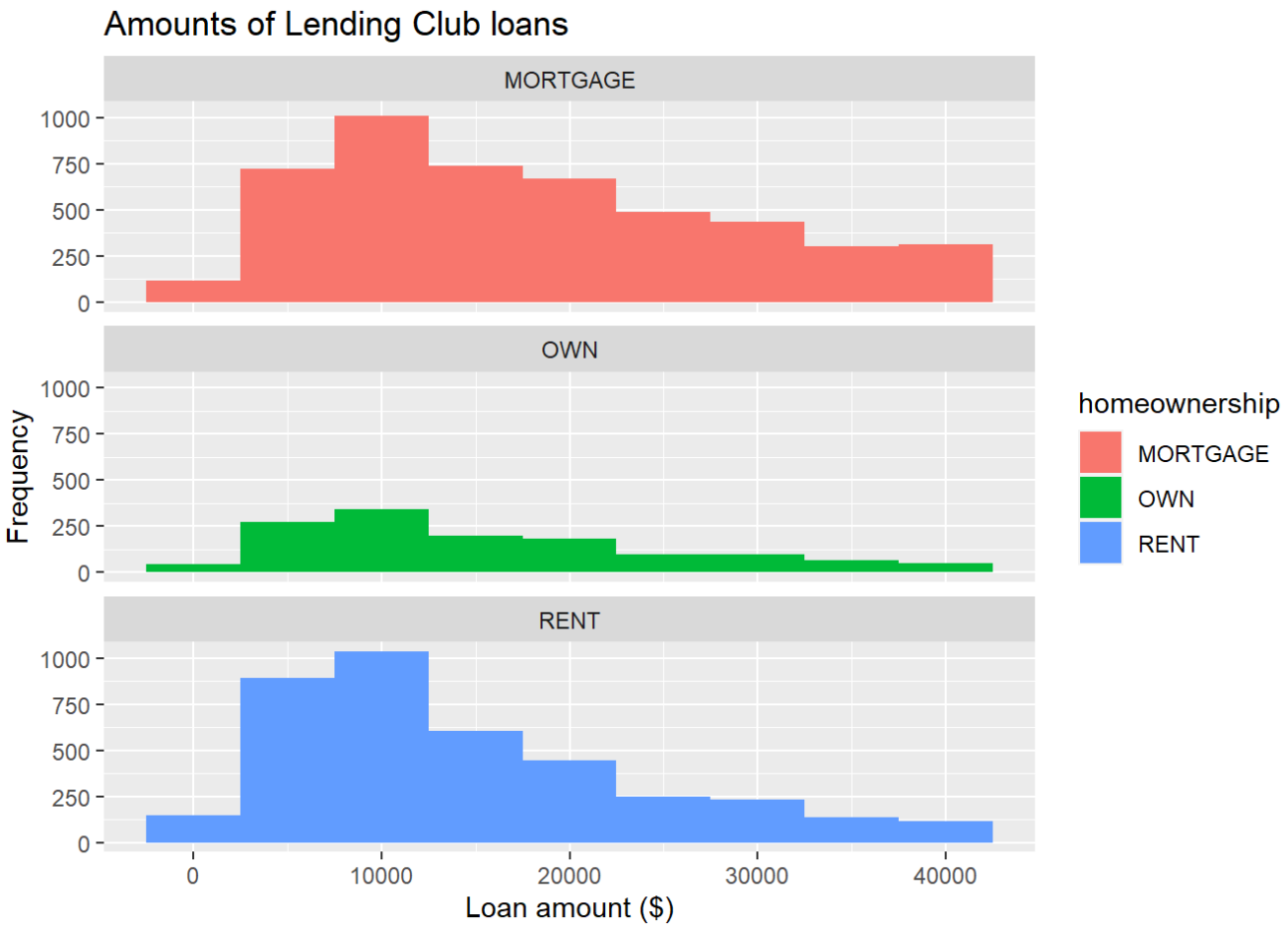
```
ggplot(loans, aes(x = loan_amount)) + geom_histogram(binwidth = 5000) +
labs(x = "Loan amount ($)", y = "Frequency", title = "Amounts of Lending Club loans" )
```



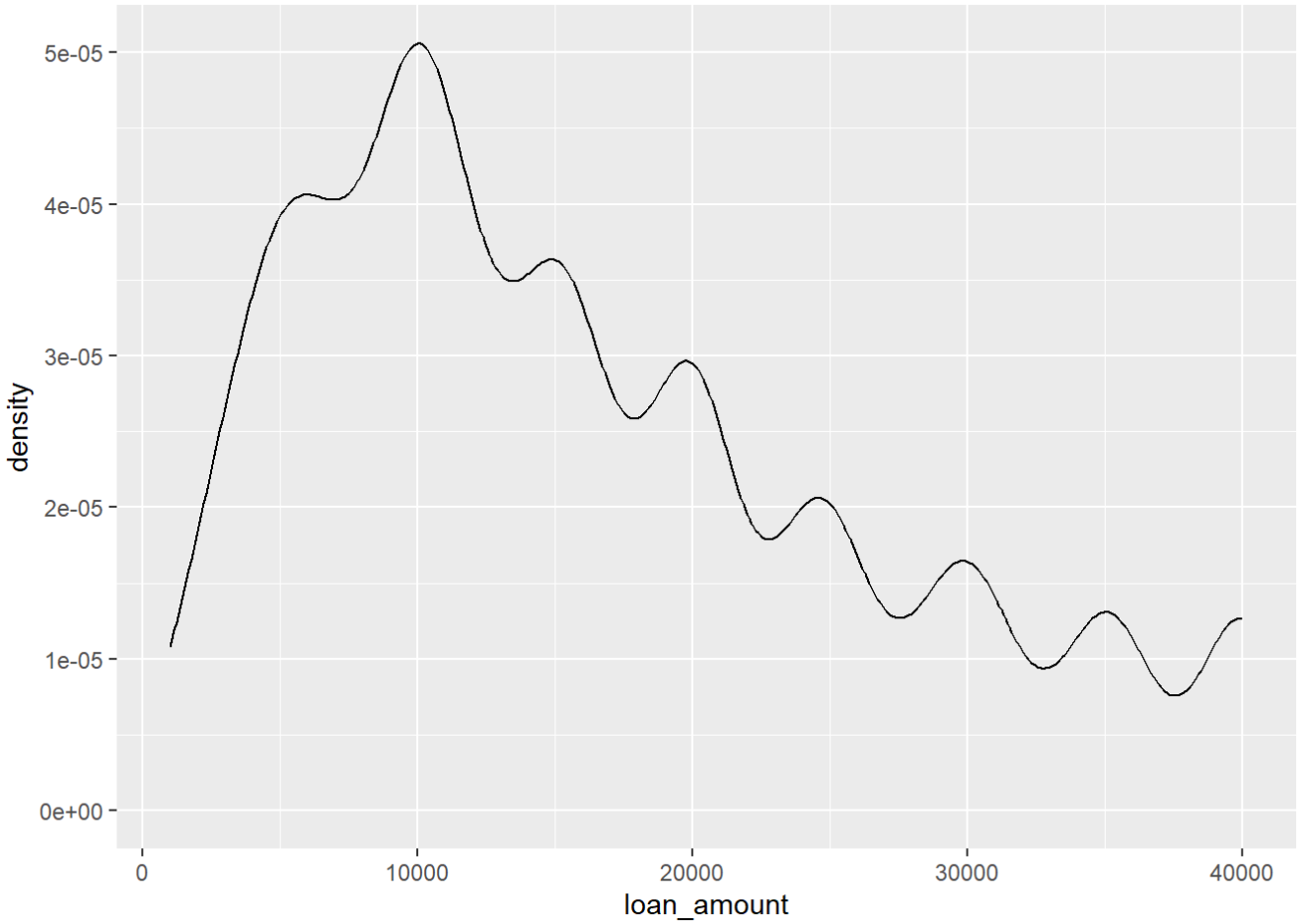

```
ggplot(loans, aes(x = loan_amount, fill = homeownership)) +
geom_histogram(binwidth = 5000, alpha = 0.5) +
labs(x = "Loan amount ($)",y = "Frequency",title = "Amounts of Lending Club loans")
```



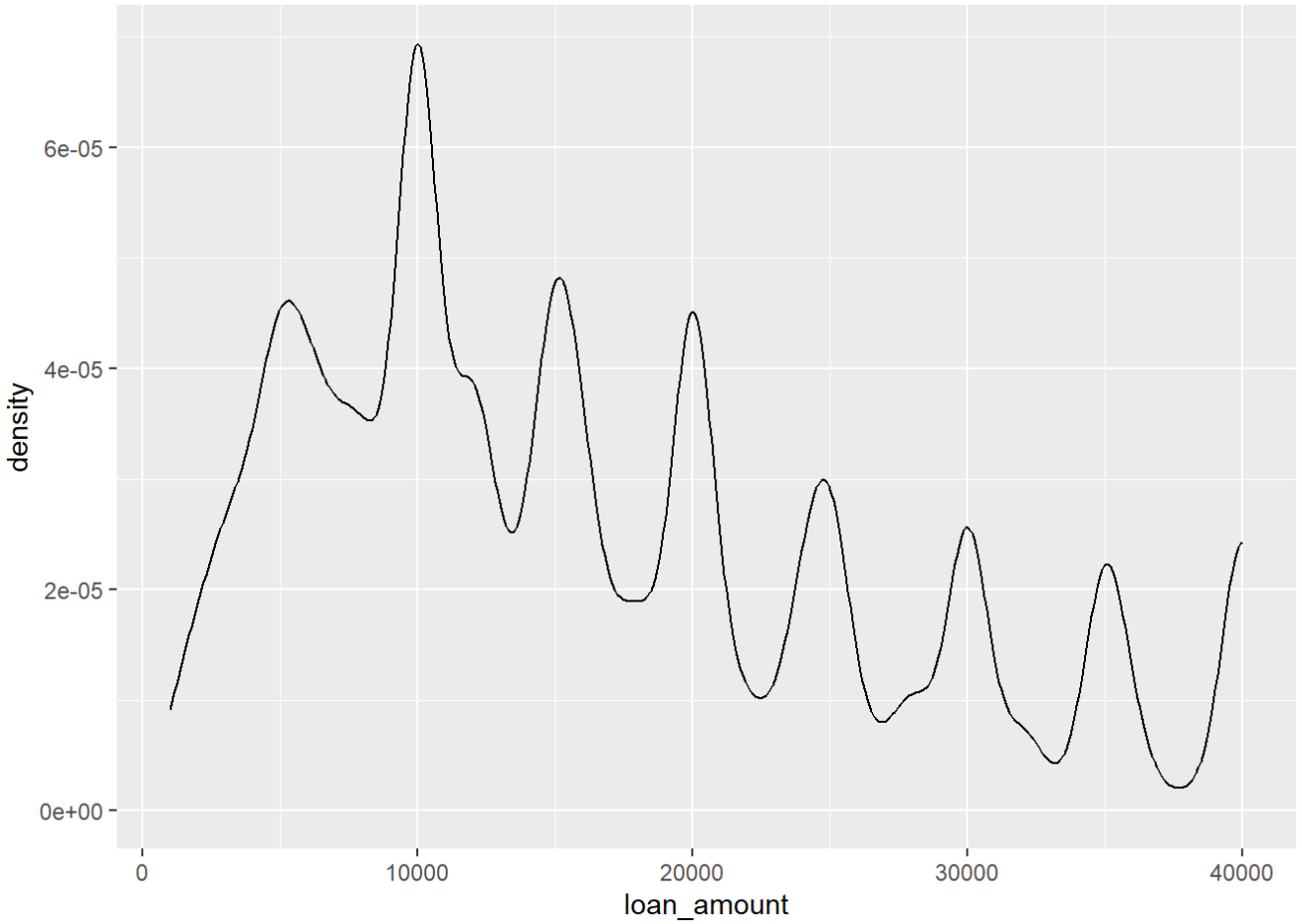

```
# Categorical variable
# Create a ggplot object using the loans dataset
ggplot(loans, aes(x = loan_amount, fill = homeownership)) +

# Add a histogram to represent the distribution of loan amounts
geom_histogram(binwidth = 5000) +

# Customize axis labels, title, and facet the plot by homeownership
labs(
  x = "Loan amount ($)",
  y = "Frequency",
  title = "Amounts of Lending Club loans"
) +

# Facet the plot by homeownership, arranging in 3 rows
facet_wrap(~ homeownership, nrow = 3)
```



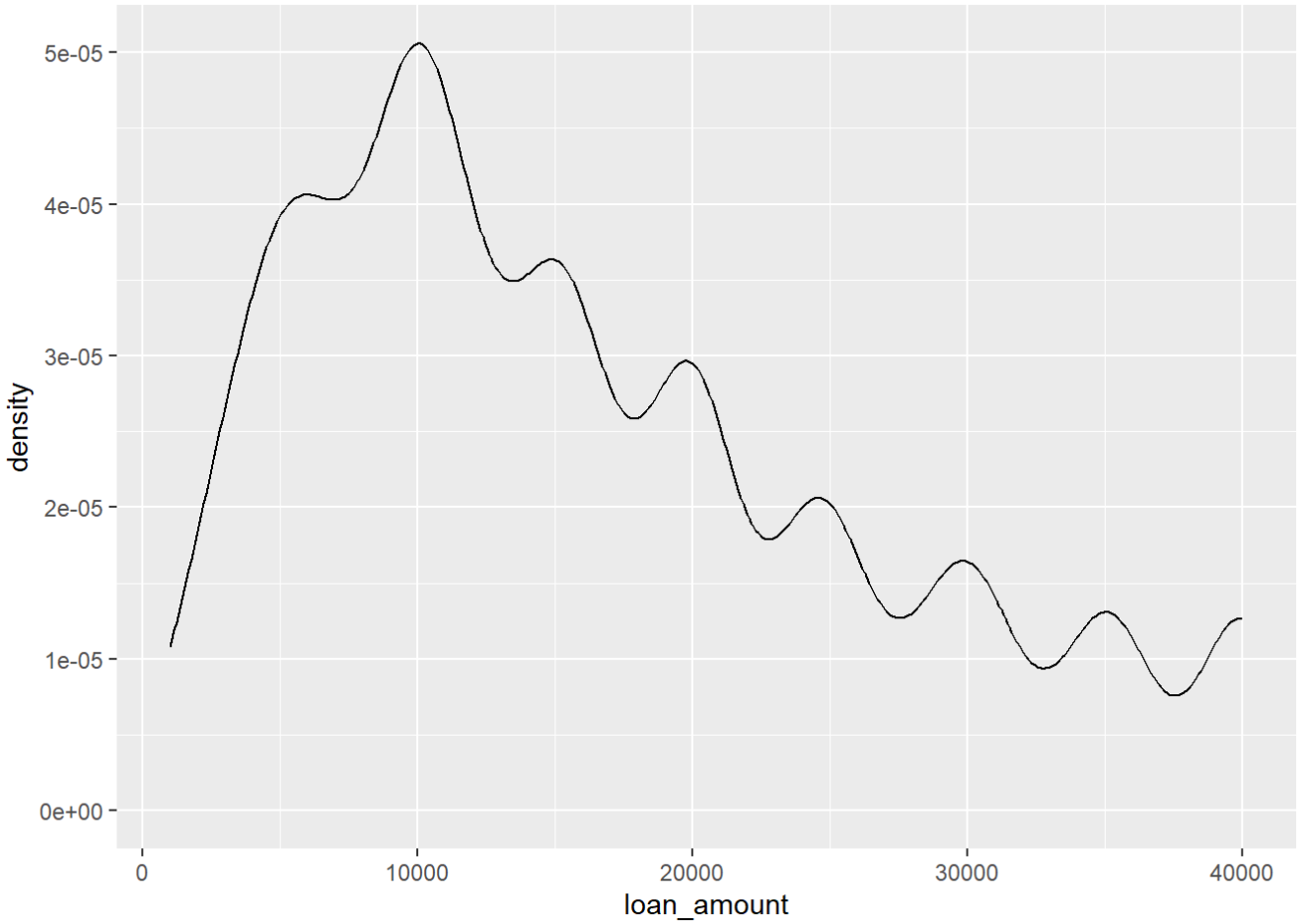

```
ggplot(loans, aes(x = loan_amount)) +
geom_density()
```



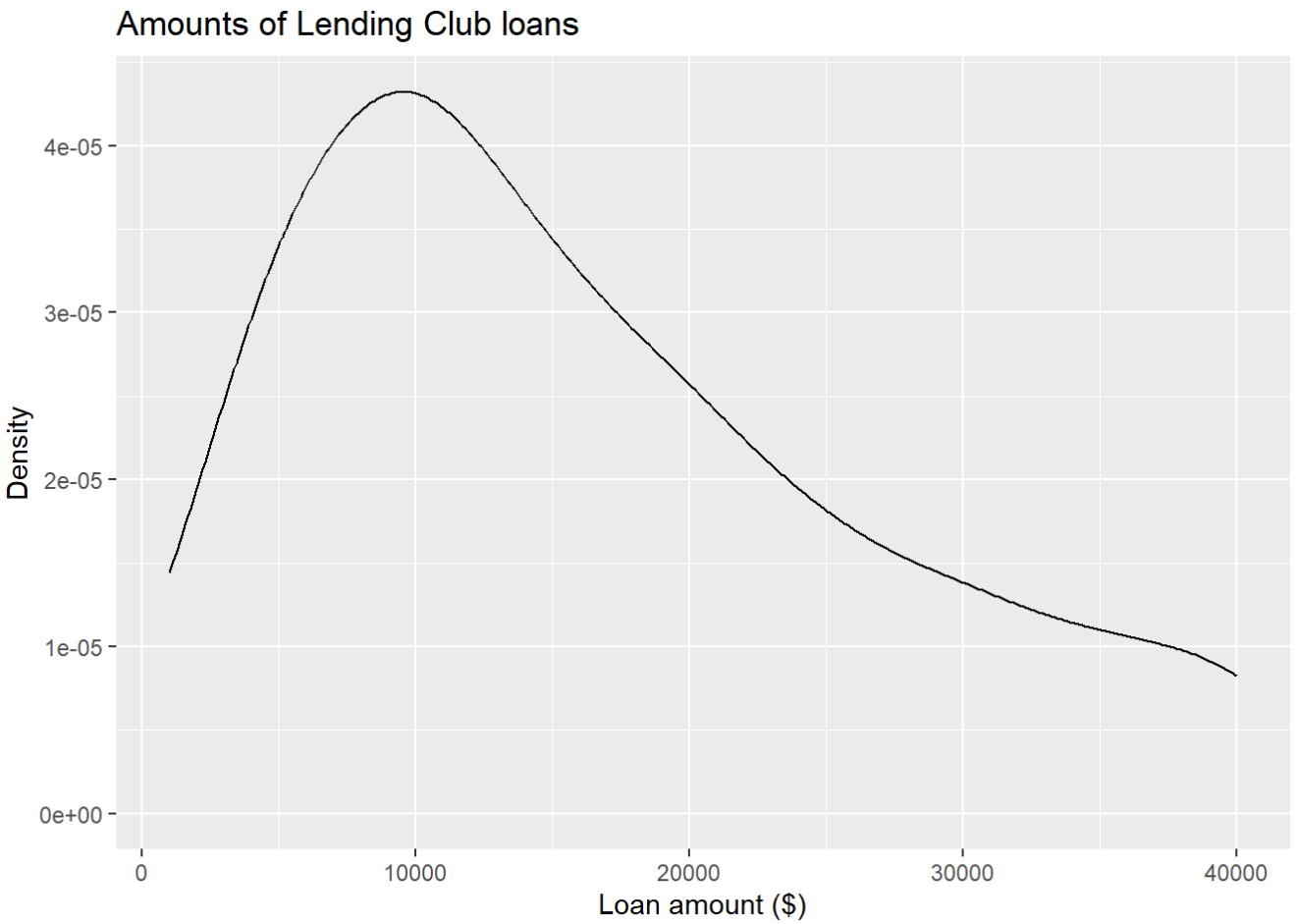

```
ggplot(loans, aes(x = loan_amount)) +
geom_density(adjust = 0.5)
```



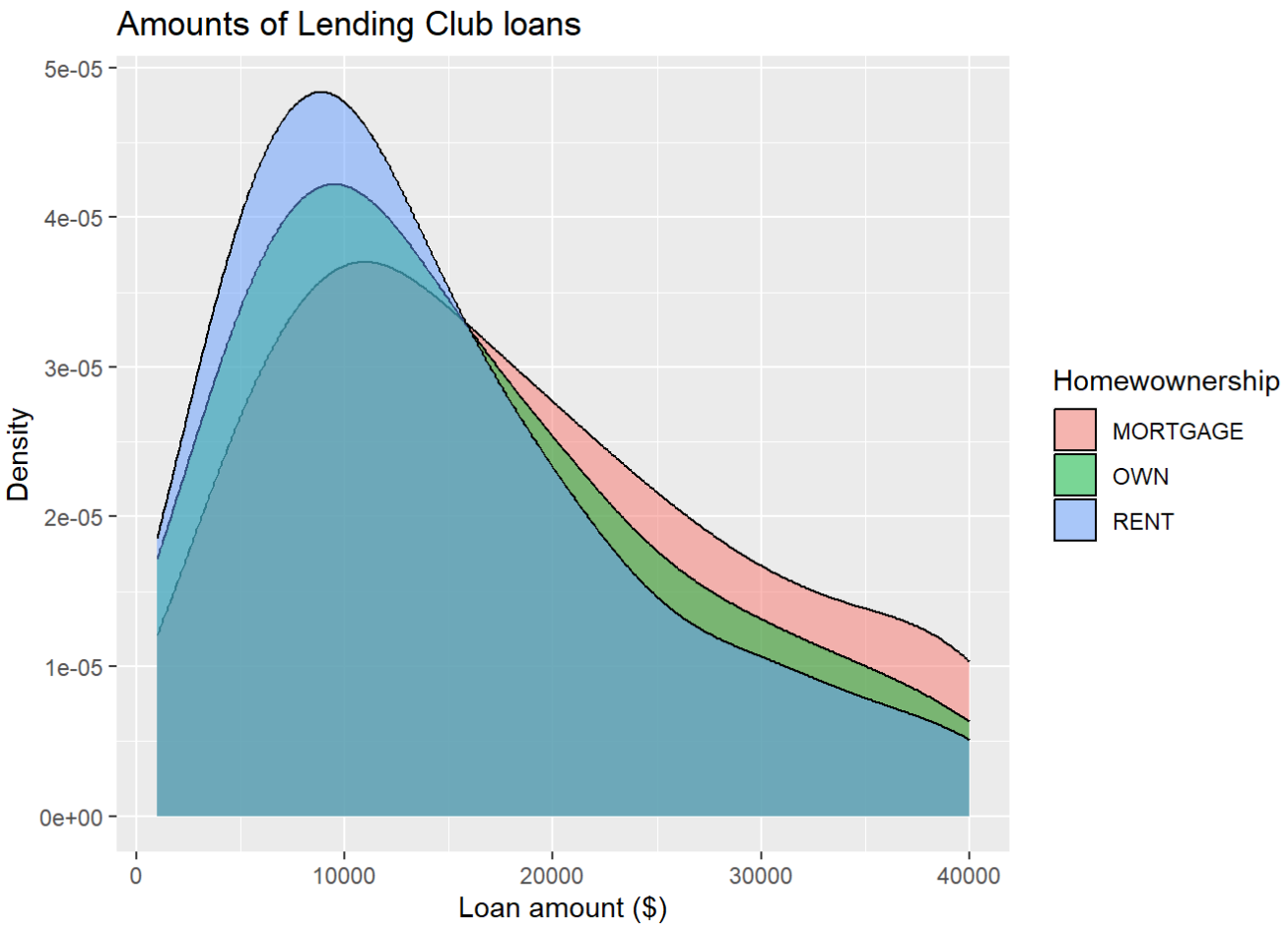

```
ggplot(loans, aes(x = loan_amount)) +
geom_density(adjust = 1) # default bandwidth
```



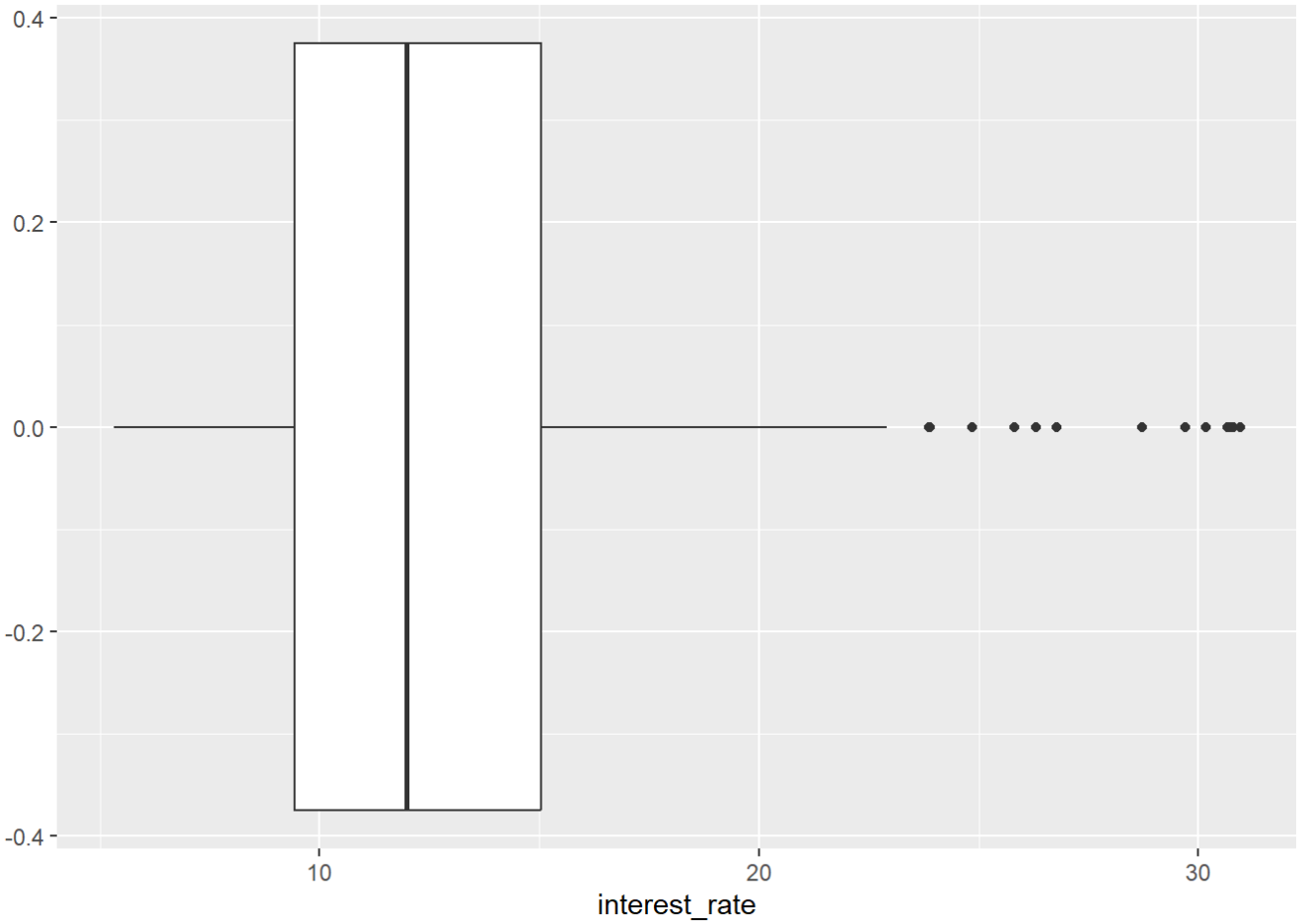

```
ggplot(loans, aes(x = loan_amount)) +
geom_density(adjust = 2) +
labs( x = "Loan amount ($)", y = "Density", title = "Amounts of Lending Club loans" )
```



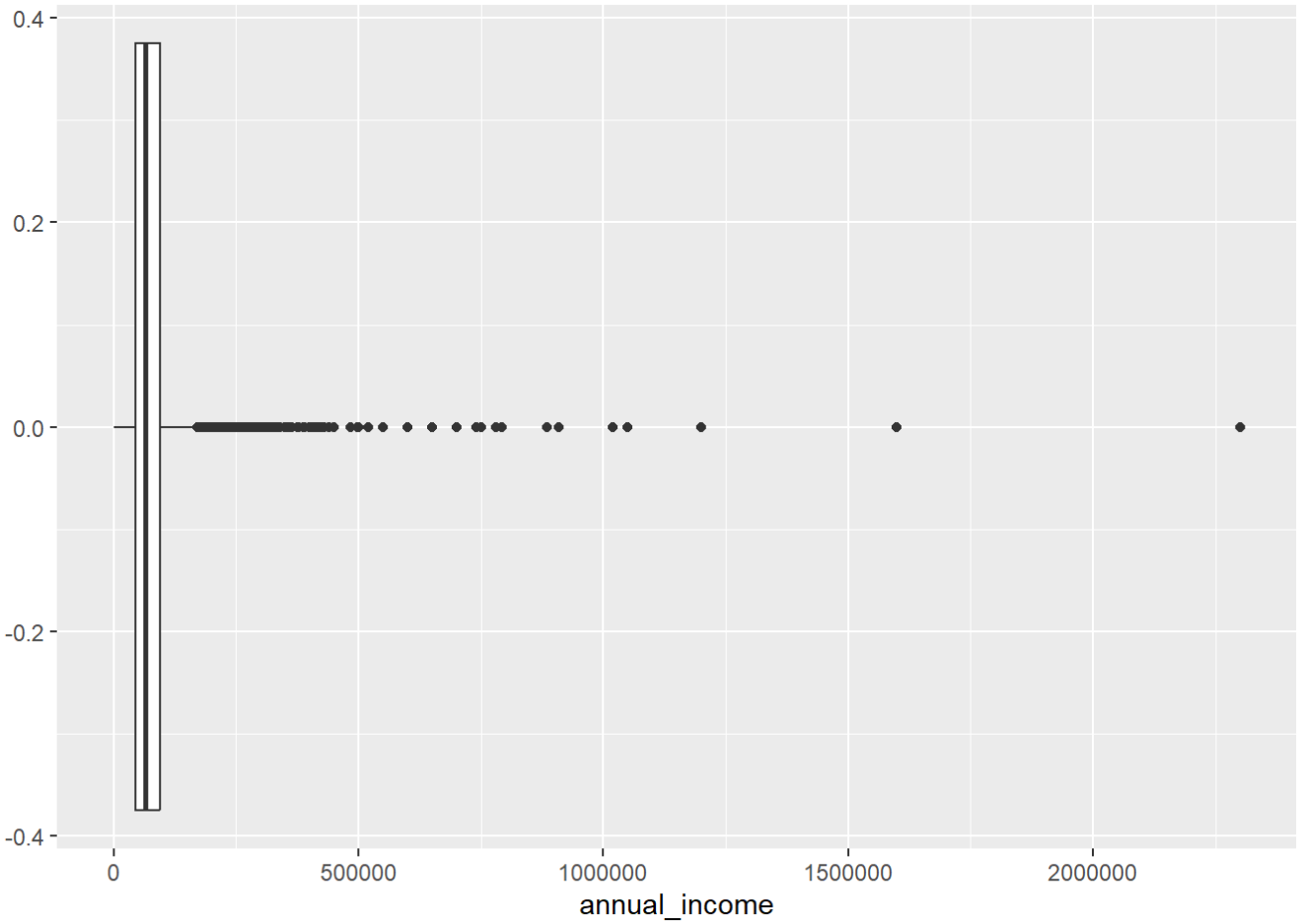

```
# Density Plot and adjustment to bandwidth
ggplot(loans, aes(x = loan_amount, fill = homeownership)) +
geom_density(adjust = 2, alpha = 0.5) + # Default = 1 bandwidth, adjust controls the smoot
hness, more smooth when adjust increase
labs( x = "Loan amount ($)", y = "Density", title = "Amounts of Lending Club loans", fill
= "Homewownership")
```



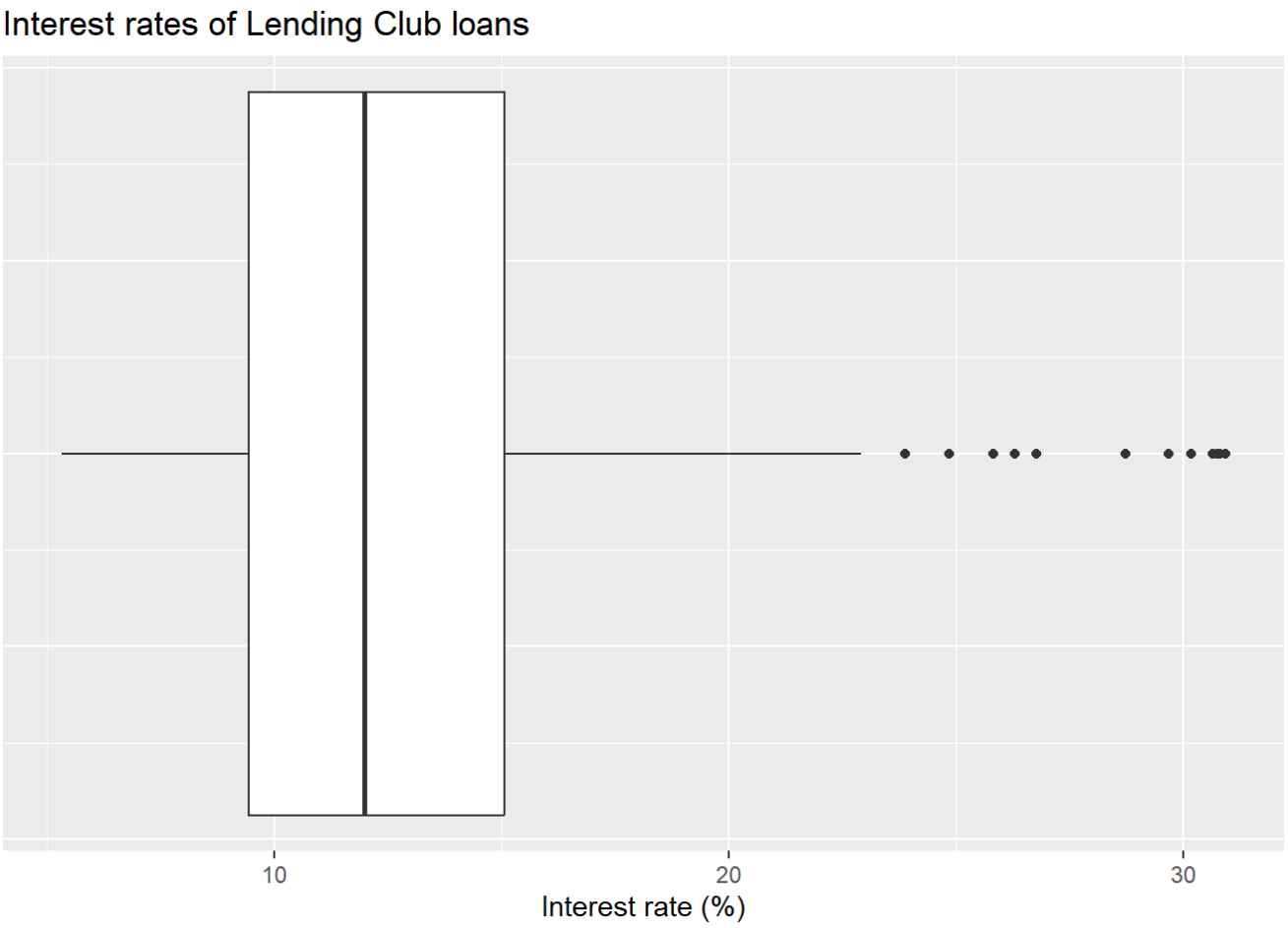

```
# Box plot and outliers
ggplot(loans, aes(x = interest_rate)) +
geom_boxplot()
```



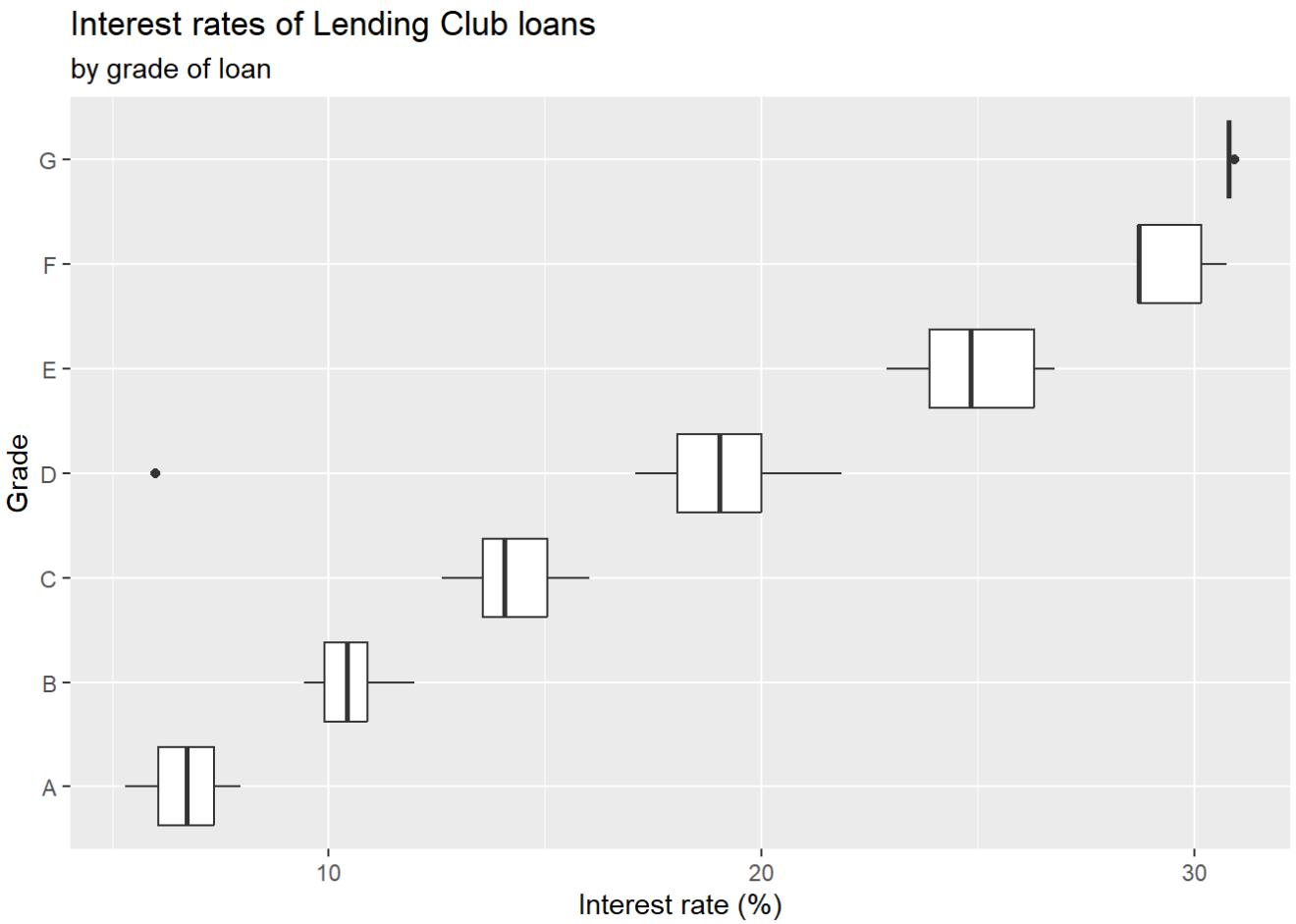

```
ggplot(loans, aes(x = annual_income)) +
geom_boxplot()
```




```
ggplot(loans, aes(x = interest_rate)) +geom_boxplot() +labs(x = "Interest rate (%)",y = NU
LL,
title = "Interest rates of Lending Club loans") +
theme( axis.ticks.y = element_blank(), axis.text.y = element_blank() )
```

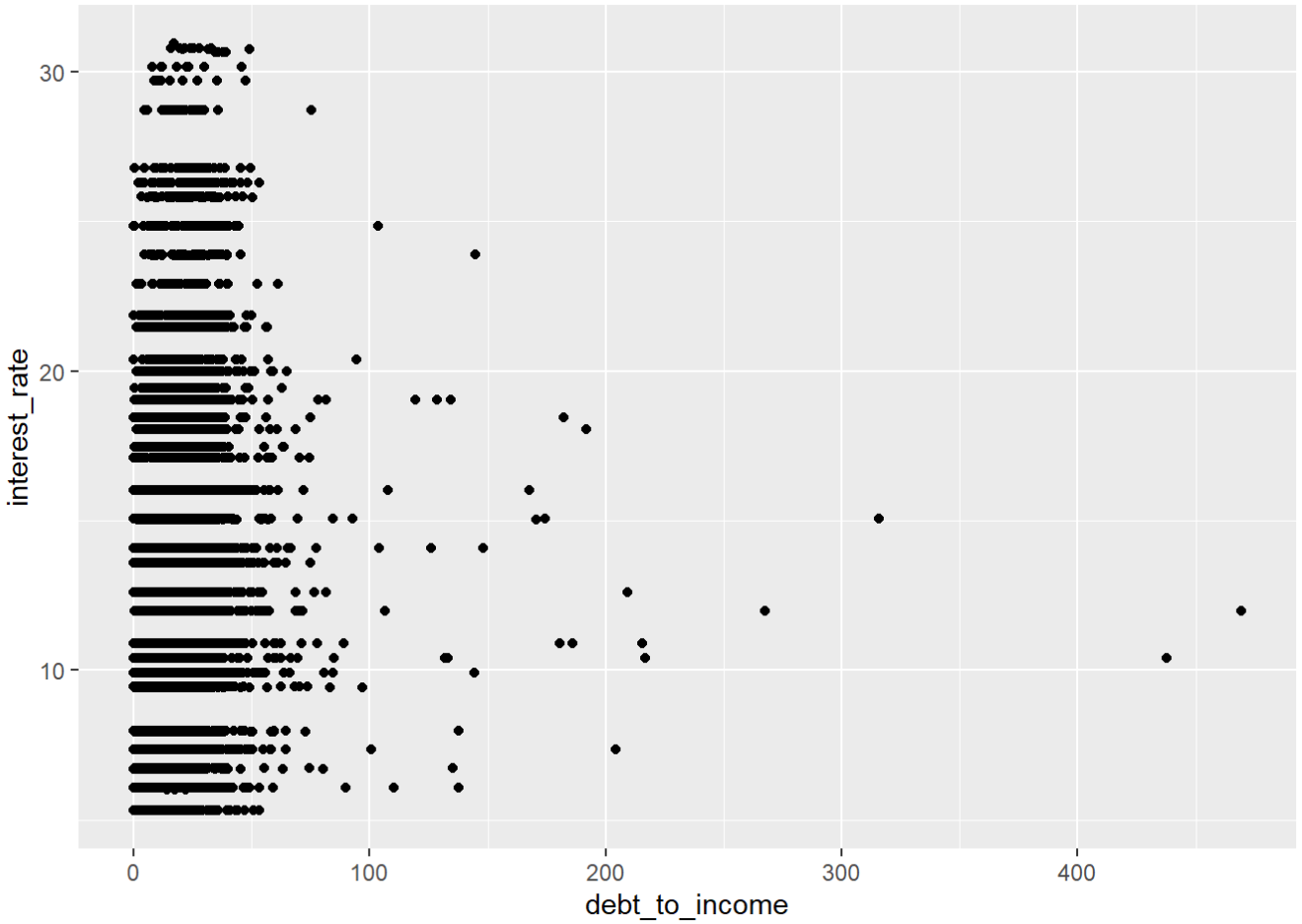



```
ggplot(loans, aes(x = interest_rate,
y = grade)) +
geom_boxplot() +
labs(x = "Interest rate (%)",y = "Grade",title = "Interest rates of Lending Club loans",su
btitle = "by grade of loan")
```



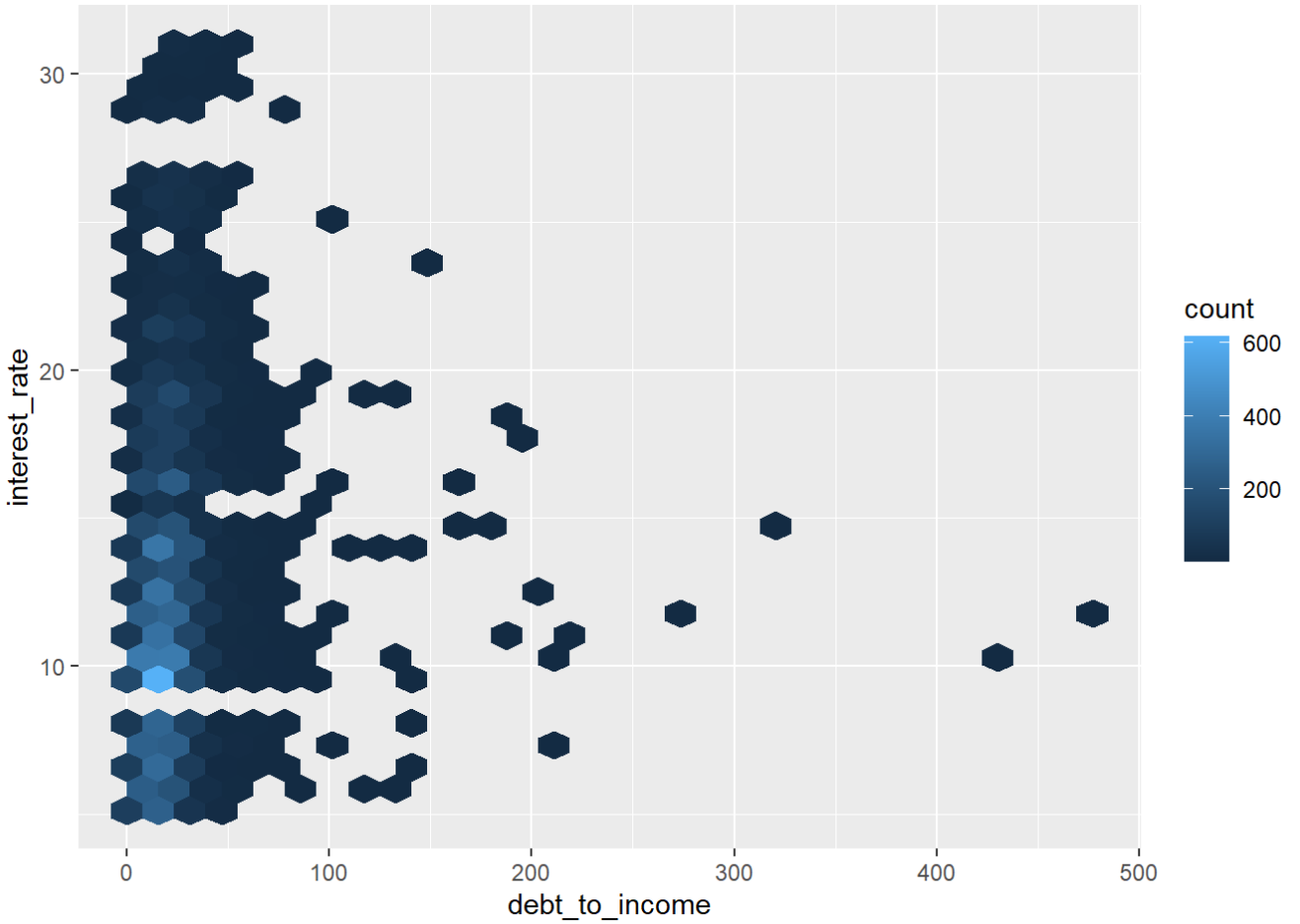

```
# Scatterplot
ggplot(loans, aes(x = debt_to_income, y = interest_rate)) +
geom_point()
```

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

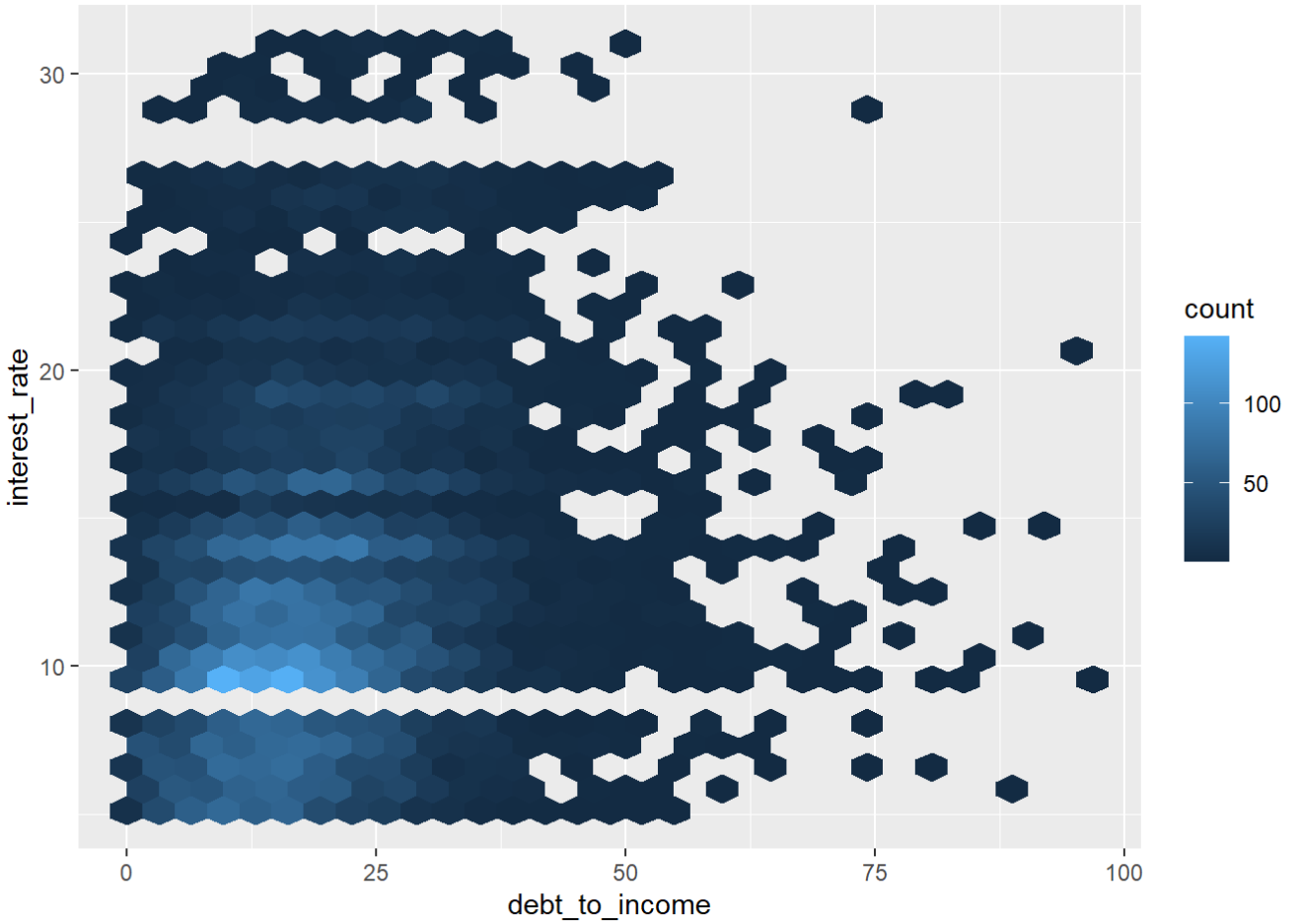



```
# Hexplot
#install.packages("hexbin")
# Load the hexbin package
library(hexbin)
ggplot(loans, aes(x = debt_to_income, y = interest_rate)) +
geom_hex()
```

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

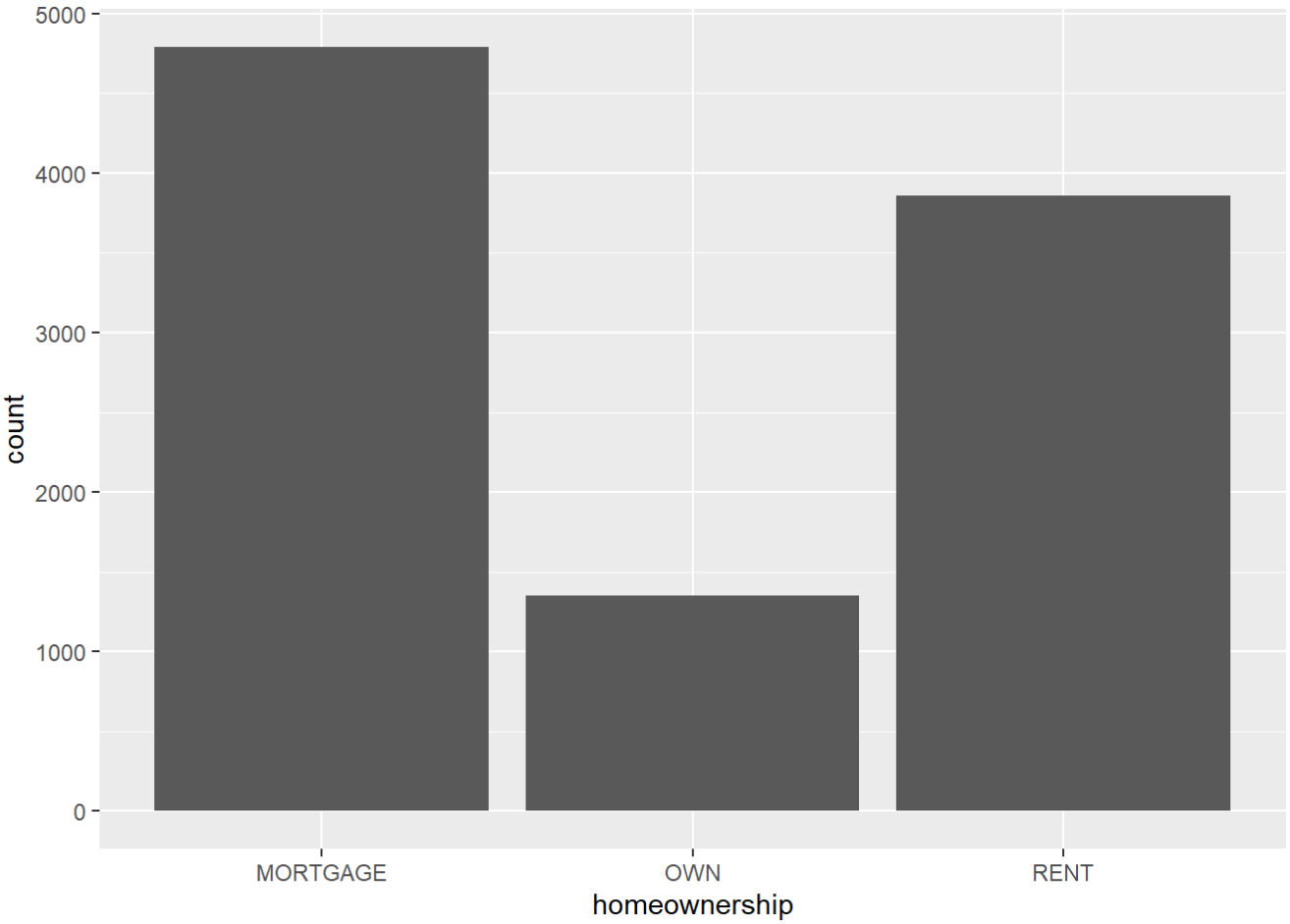



```
# Another hex plot
ggplot(loans %>% filter(debt_to_income < 100),
       aes(x = debt_to_income, y = interest_rate)) +
geom_hex()
```

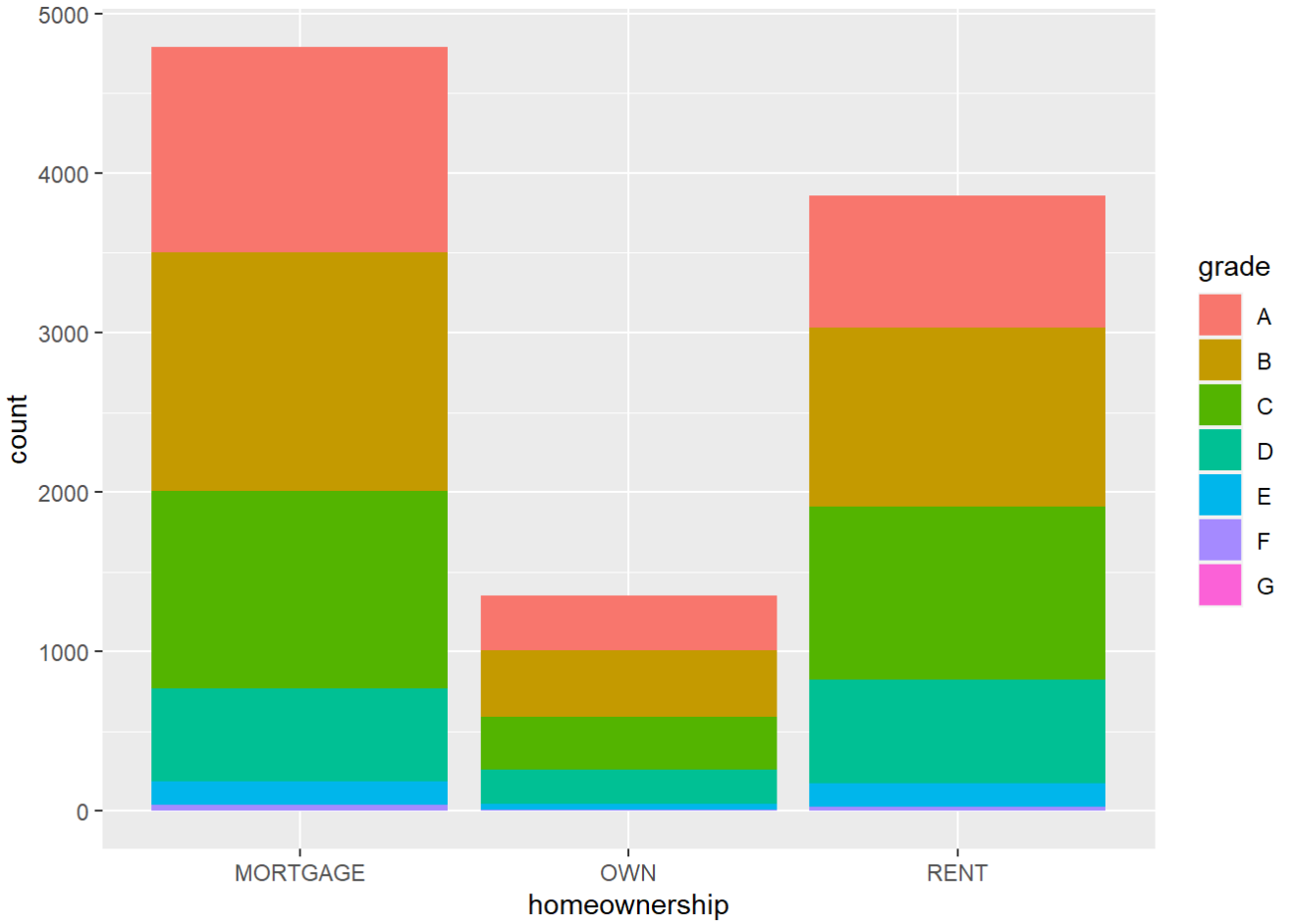


Visualise categoric varibale (Slide #67)

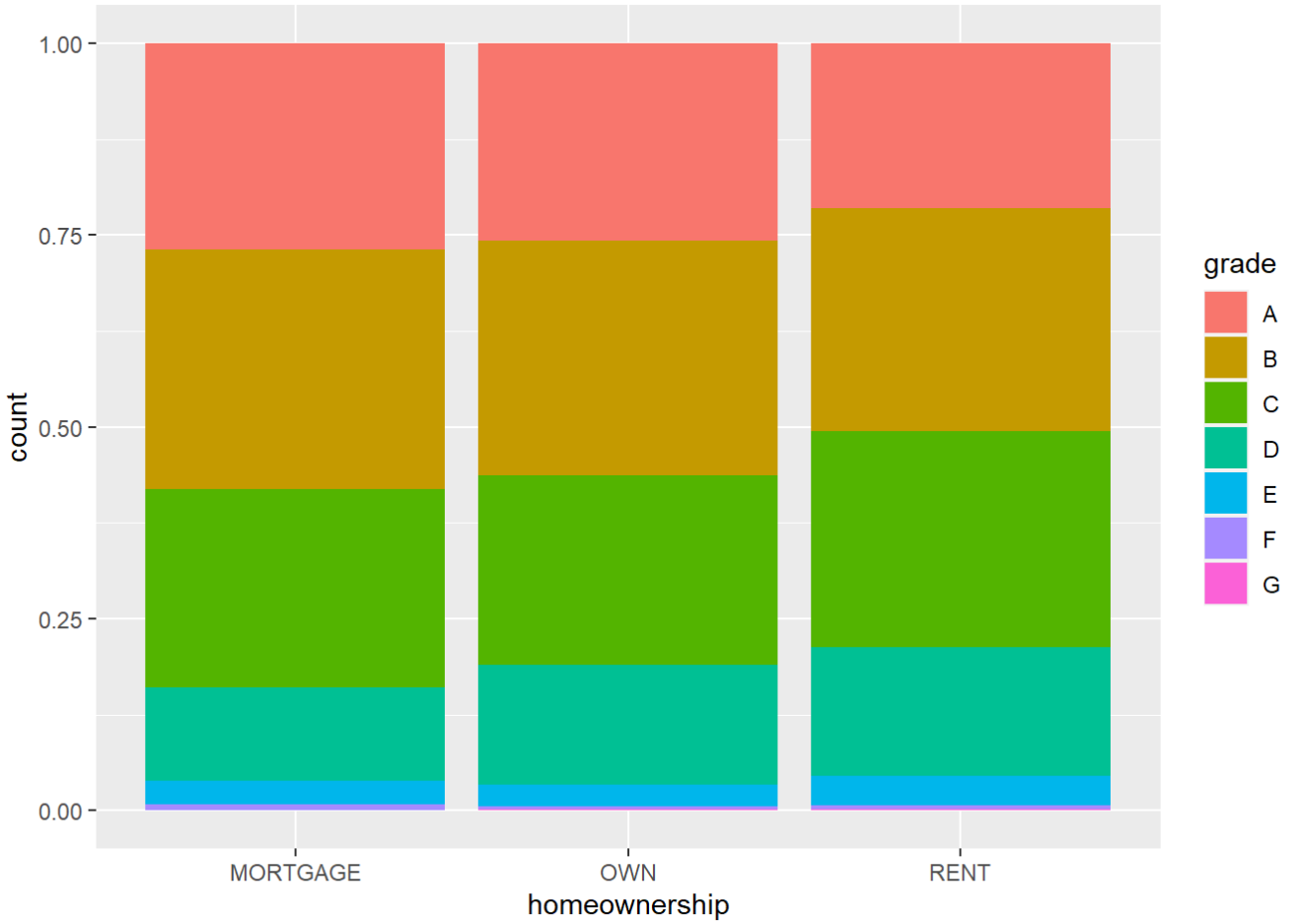
```
ggplot(loans, aes(x = homeownership)) +
geom_bar()
```



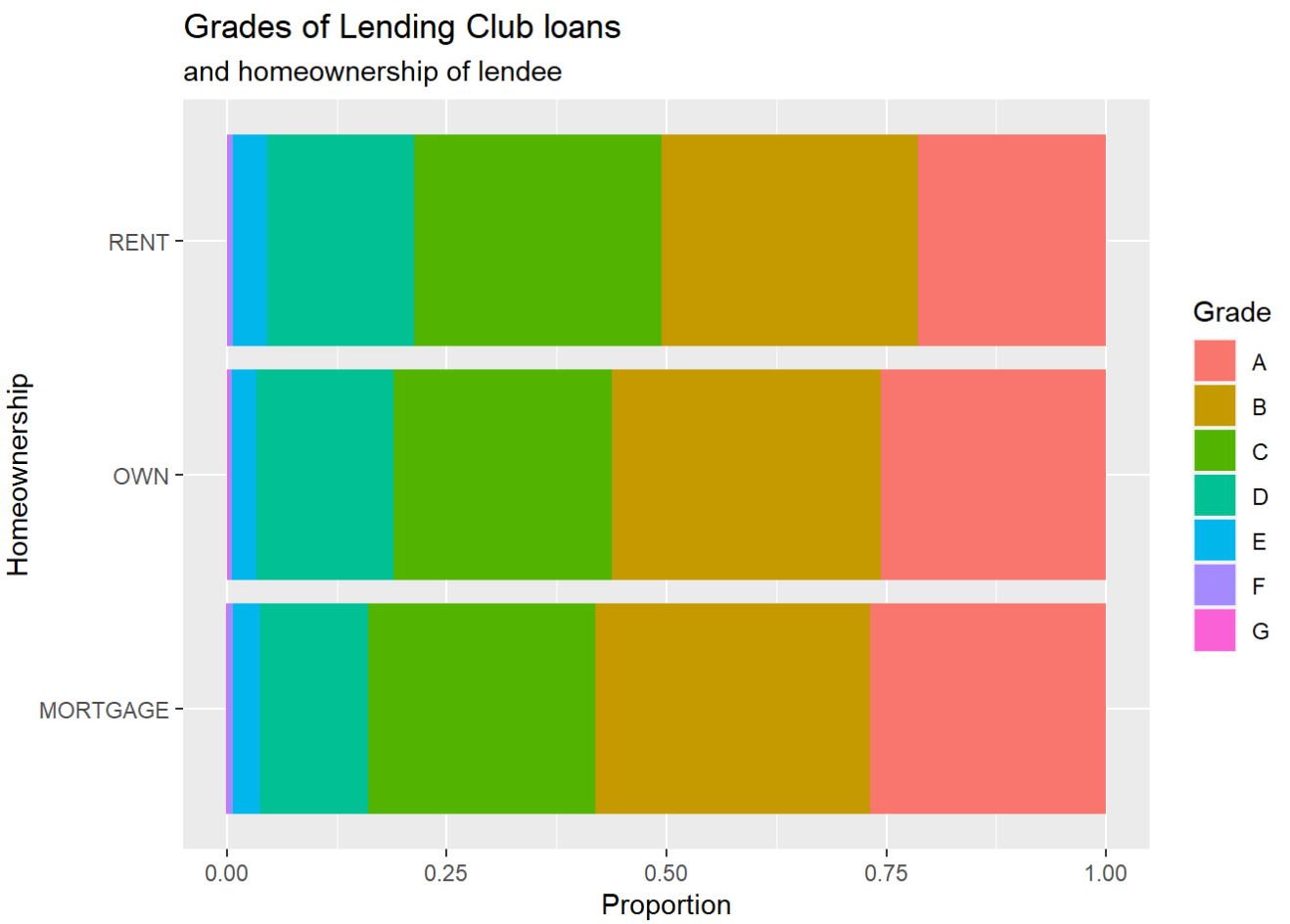

```
# Bar plot
# Segmented
ggplot(loans, aes(x = homeownership,
        fill = grade)) +
geom_bar()
```



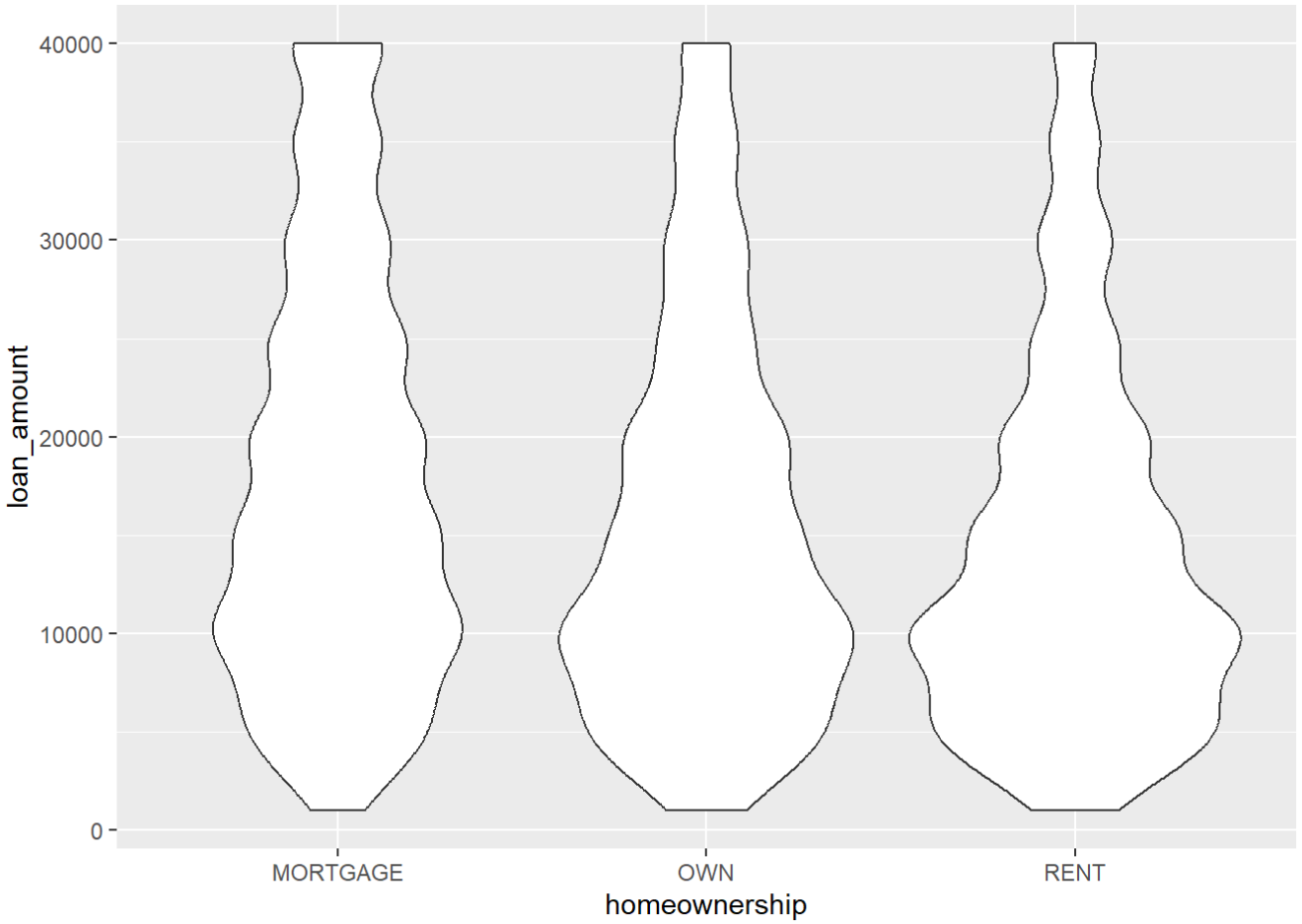

```
# Display segemnetd bar plot and evaluate the percentage of which grade
ggplot(loans, aes(x = homeownership, fill = grade)) +
geom_bar(position = "fill")
```




```
#Customise bar plots
ggplot(loans, aes(y = homeownership, fill = grade)) + geom_bar(position = "fill") +
labs( x = "Proportion", y = "Homeownership", fill = "Grade", title = "Grades of Lending Cl
ub loans", subtitle = "and homeownership of lendee")
```

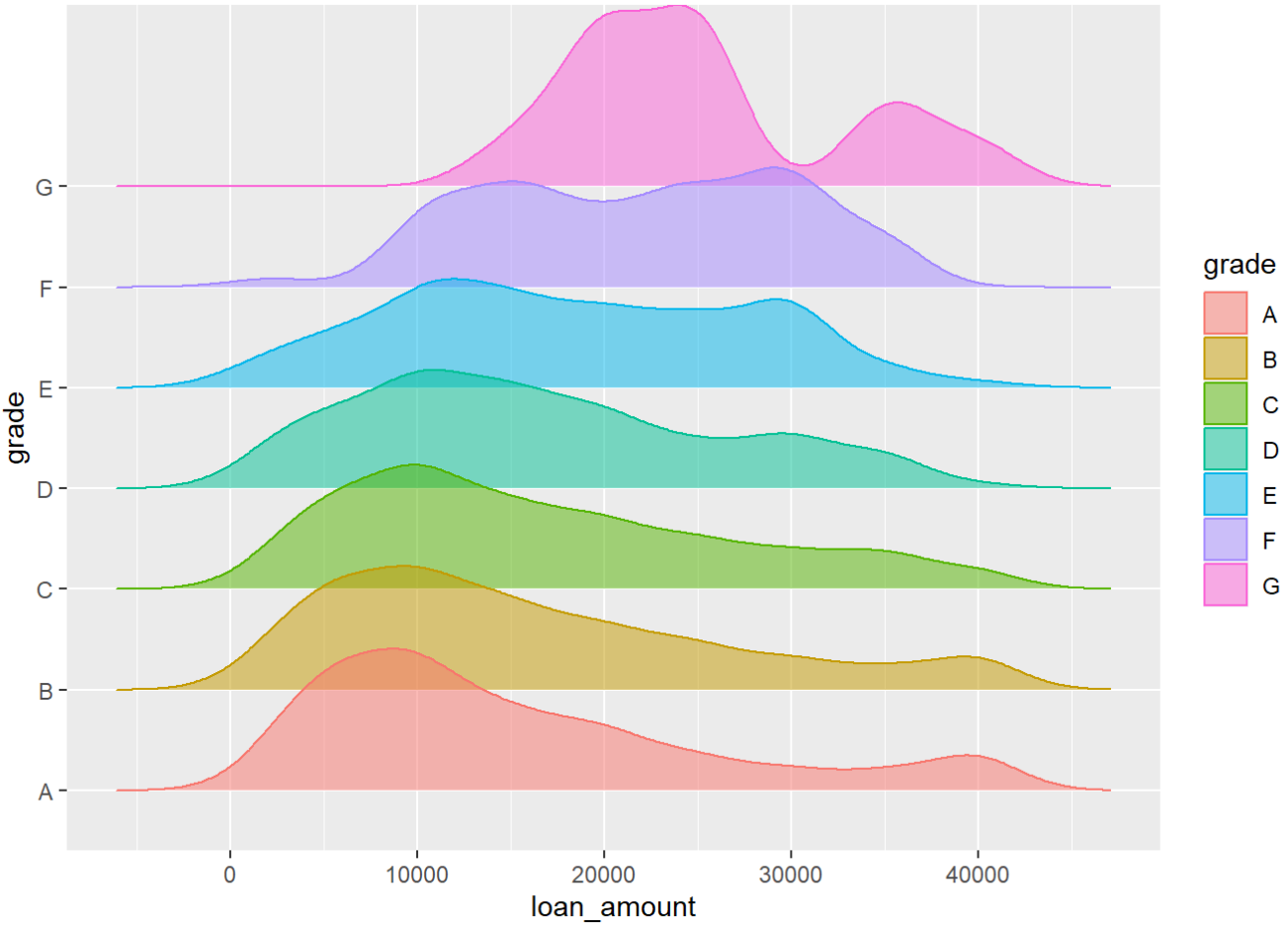



```
# Visulaising variables of varied types
# Violin Plots
ggplot(loans, aes(x = homeownership, y = loan_amount)) +
geom_violin()
```




```
# Ridge plots
#install.packages("ggridges")
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