ODSC: ggplot2 Graph Gallery

Categories and distributions: amounts

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Resources :

The graphs

- **The `ggplot2` book by Hadley Wickham, Danielle Navarro, and Thomas Lin Pedersen**

- **Data Visualization: A Practical Introduction by Kieran Healy (2018)**

- **R Graphics Cookbook, 2nd edition by Winston Chang (2022)**

Graph Categories

- **Fundamentals of Data Visualization by Claus O. Wilke (2019)**

- **Data Visualisation: A Handbook for Data Driven Design by Andy Kirk (2019)**

- **Data Points by Nathan Yau (2013)**

Graph Categories: *The 'CHRTS' Families of Chart Types*

From *"Data Visualisation: A Handbook for Data Driven Design"*, Andy Kirk (2019)

Comparing categories and distributions

Hierarchies/part-to-whole relationships

Correlations and connections

Trends and intervals over time

Maps, overlays, and/or distortions

Graph Categories: Directory of Visualizations

From *"Fundamentals of Data Visualization"*, Claus O. Wilke (2019)

Amounts

Distributions

Proportions

X–Y relationships

Geospatial Data

Uncertainty

Comprehensive Graph Gallery

Comparing categories and values

- *Amounts*
- Distributions

Hierarchies and proportions

- Part-to-whole relationships

Trends, correlations and connections

- X–Y relationships

Maps, overlays, and distortions

- Geospatial Data

Statistical measures

- Uncertainty

Data

Data come from the following packages:

- `palmerpenguins`

- `fivethirtyeight`

- `ggplot2movies`

Or created using `tribble()`

```
tribble(
  ~`variable 1`, ~`variable 2`,
            "a",             1,
            "b",             2,
            "c",             3)
```

variable 1	variable 2
<chr>	<dbl>
a	1
b	2
c	3

3 rows

Load data packages

```r
library(palmerpenguins)
library(fivethirtyeight)
library(ggplot2movies)
```

palmerpenguins

palmerpenguins package website

```
palmerpenguins::penguins -> penguins
```

species	island	bill_length_mm	bill_depth_mm	flipper_length_mm	body_mass_g	sex	year
<fct>	<fct>	<dbl>	<dbl>	<int>	<int>	<fct>	<int>
Adelie	Torgersen	39.1	18.7	181	3750	male	2007
Adelie	Torgersen	39.5	17.4	186	3800	female	2007
Adelie	Torgersen	40.3	18.0	195	3250	female	2007
Adelie	Torgersen	*NA*	*NA*	*NA*	*NA*	*NA*	2007
Adelie	Torgersen	36.7	19.3	193	3450	female	2007
Adelie	Torgersen	39.3	20.6	190	3650	male	2007
Adelie	Torgersen	38.9	17.8	181	3625	female	2007
Adelie	Torgersen	39.2	19.6	195	4675	male	2007
Adelie	Torgersen	34.1	18.1	193	3475	*NA*	2007
Adelie	Torgersen	42.0	20.2	190	4250	*NA*	2007

1-10 of 344 rows

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fivethirtyeight

fivethirtyeight package website

All datasets are listed below with descriptions

```r
datasets("fivethirtyeight")
```

```
dataset
<chr>
US_births_1994_2003
US_births_2000_2014
ahca_polls
airline_safety
antiquities_act
august_senate_polls
avengers
bachelorette
bad_drivers
bechdel
1-10 of 129 rows | 1-1 of 2 columns          Previous 1 2 3 4 5 6 ... 13 Next
```

ggplot2movies

ggplot2movies package website

We're using `movies_data` (derived version of the `ggplot2movies::movies`)

```
movies_data
```

title	year	length	budget	rating	mpaa
<chr>	<int>	<int>	<int>	<dbl>	<fct>
100 Mile Rule	2002	98	1100000	5.6	R
13 Going On 30	2004	98	37000000	6.4	PG-13
15 Minutes	2001	120	42000000	6.1	R
2 Fast 2 Furious	2003	107	76000000	5.1	PG-13
2046	2004	129	12000000	7.6	R
21 Grams	2003	124	20000000	8.0	R
25th Hour	2002	135	15000000	7.8	R
3000 Miles to Graceland	2001	125	62000000	5.4	R
40 Days and 40 Nights	2002	96	17000000	5.4	R
50 First Dates	2004	99	75000000	6.8	PG-13

1-10 of 751 rows | 1-6 of 7 columns Previous **1** 2 3 4 5 6 ... 76 Next

Comparing Categories and Distributions

Amounts

Amounts: *Bars*

The bar chart (or graph) is typically used to display counts. Bar charts can be arranged vertically or horizontally, stacked, diverging, or dodged. In `ggplot2`, bar charts can be built using `geom_bar()` or `geom_col()`

Amounts: *Bars*

```r
movies_data
```

title <chr>	year <int>	length <int>	budget <int>	rating <dbl>	mpaa <fct>
100 Mile Rule	2002	98	1100000	5.6	R
13 Going On 30	2004	98	37000000	6.4	PG-13
15 Minutes	2001	120	42000000	6.1	R
2 Fast 2 Furious	2003	107	76000000	5.1	PG-13
2046	2004	129	12000000	7.6	R
21 Grams	2003	124	20000000	8.0	R
25th Hour	2002	135	15000000	7.8	R
3000 Miles to Graceland	2001	125	62000000	5.4	R
40 Days and 40 Nights	2002	96	17000000	5.4	R
50 First Dates	2004	99	75000000	6.8	PG-13

1-10 of 751 rows | 1-6 of 7 columns

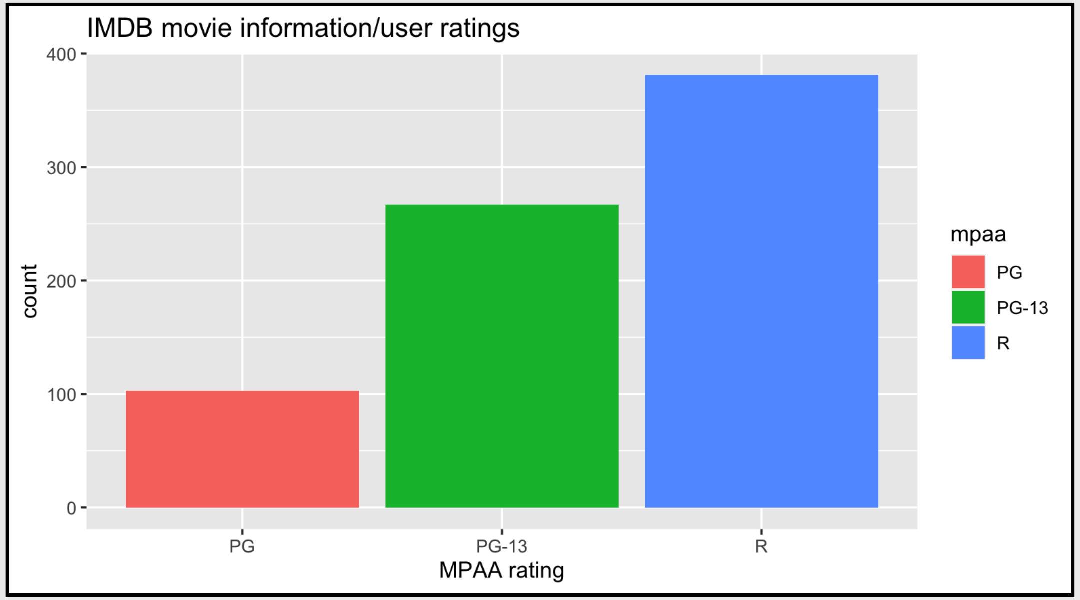
Previous **1** 2 3 4 5 6 ... 76 Next

Amounts: *Bars*

Map `mpaa` to the `x` axis and to the `fill` aesthetic inside the `aes()` of `geom_bar()`, and add the labels

```
labs_geom_bar <- labs(
  x = "MPAA rating",
  title = "IMDB movie information/user ratings")
```

```
ggplot(data = movies_data,
       aes(x = mpaa)) +
    geom_bar(aes(fill = mpaa)) +
   labs_geom_bar
```



Amounts: *Grouped Bars*

To create grouped bar charts (compare the values of a numerical variable across the levels of a categorical variable) we can use the `geom_col()` function.

Amounts: *Grouped Bars*

```
movies_data
```

title	year	length	budget	rating	mpaa
<chr>	<int>	<int>	<int>	<dbl>	<fct>
100 Mile Rule	2002	98	1100000	5.6	R
13 Going On 30	2004	98	37000000	6.4	PG-13
15 Minutes	2001	120	42000000	6.1	R
2 Fast 2 Furious	2003	107	76000000	5.1	PG-13
2046	2004	129	12000000	7.6	R
21 Grams	2003	124	20000000	8.0	R
25th Hour	2002	135	15000000	7.8	R
3000 Miles to Graceland	2001	125	62000000	5.4	R
40 Days and 40 Nights	2002	96	17000000	5.4	R
50 First Dates	2004	99	75000000	6.8	PG-13

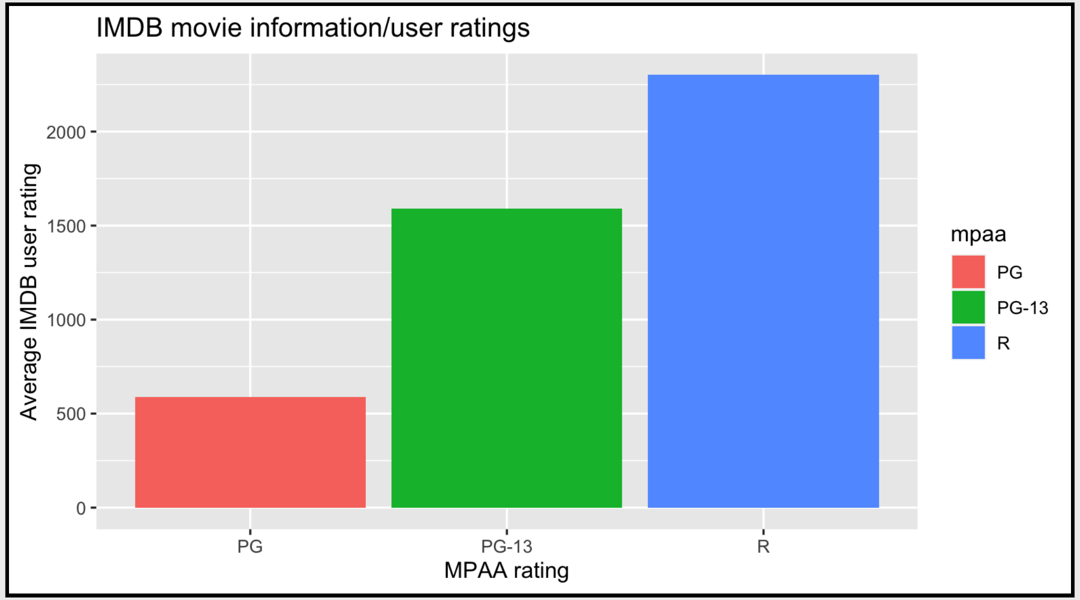
1-10 of 751 rows | 1-6 of 7 columns   Previous 1 2 3 4 5 6 ... 76 Next

Amounts: *Grouped Bars*

Map `mpaa` to the `x` axis, `rating` to the `y` axis, and `mpaa` to `fill` inside the `aes()` of `geom_col()`, and add the labels

```r
labs_geom_col <- labs(
  x = "MPAA rating",
  y = "Average IMDB user rating",
  title = "IMDB movie information/user ratings")
```

```r
ggplot(data = movies_data,
           aes(x = mpaa,
               y = rating)) +
    geom_col(aes(fill = mpaa)) +
    labs_geom_col
```



Amounts: *Stacked Bars*

We can also use bars to look at numeric and categorical variables using `geom_bar()` by setting `fill` argument.

Amounts: *Stacked Bars*

```
penguins
```

species	island	bill_length_mm	bill_depth_mm	flipper_length_mm	body_mass_g	sex	year
<fct>	<fct>	<dbl>	<dbl>	<int>	<int>	<fct>	<int>
Adelie	Torgersen	39.1	18.7	181	3750	male	2007
Adelie	Torgersen	39.5	17.4	186	3800	female	2007
Adelie	Torgersen	40.3	18.0	195	3250	female	2007
Adelie	Torgersen	*NA*	*NA*	*NA*	*NA*	*NA*	2007
Adelie	Torgersen	36.7	19.3	193	3450	female	2007
Adelie	Torgersen	39.3	20.6	190	3650	male	2007
Adelie	Torgersen	38.9	17.8	181	3625	female	2007
Adelie	Torgersen	39.2	19.6	195	4675	male	2007
Adelie	Torgersen	34.1	18.1	193	3475	*NA*	2007
Adelie	Torgersen	42.0	20.2	190	4250	*NA*	2007

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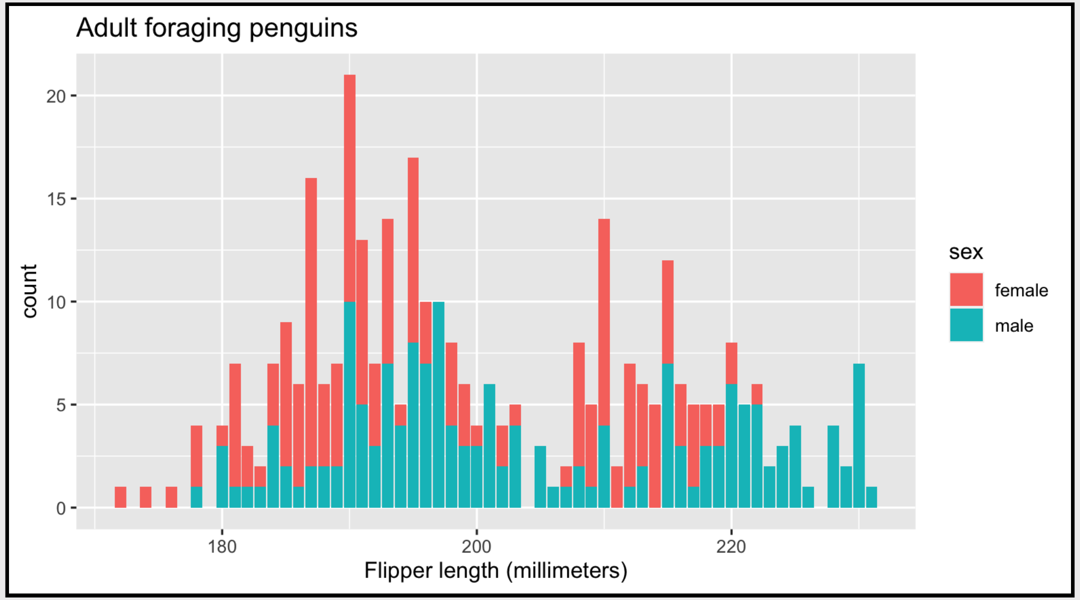
Amounts: *Stacked Bars*

Map `flipper_length_mm` to the `x` axis, `sex` to `fill`, the `geom_bar()` layer, and add the labels

```r
labs_geom_bar_stacked <- labs(
  x = "Flipper length (millimeters)",
  title = "Adult foraging penguins")
```

```r
# remove missing sex
penguins_stacked <- filter(penguins,
                        !is.na(sex))
ggplot(data = penguins_stacked,
      aes(x = flipper_length_mm,
       fill = sex)) +
    geom_bar() +
    labs_geom_bar_stacked
```



Amounts: *Stacked Bars*

We can extend `geom_bar()` by setting the `y` to a numeric variable and using both the `x` and `fill` aesthetics (two categorical variables).

Amounts: *Stacked Bars*

```
penguins
```

species	island	bill_length_mm	bill_depth_mm	flipper_length_mm	body_mass_g	sex	year
<fct>	<fct>	<dbl>	<dbl>	<int>	<int>	<fct>	<int>
Adelie	Torgersen	39.1	18.7	181	3750	male	2007
Adelie	Torgersen	39.5	17.4	186	3800	female	2007
Adelie	Torgersen	40.3	18.0	195	3250	female	2007
Adelie	Torgersen	*NA*	*NA*	*NA*	*NA*	*NA*	2007
Adelie	Torgersen	36.7	19.3	193	3450	female	2007
Adelie	Torgersen	39.3	20.6	190	3650	male	2007
Adelie	Torgersen	38.9	17.8	181	3625	female	2007
Adelie	Torgersen	39.2	19.6	195	4675	male	2007
Adelie	Torgersen	34.1	18.1	193	3475	*NA*	2007
Adelie	Torgersen	42.0	20.2	190	4250	*NA*	2007

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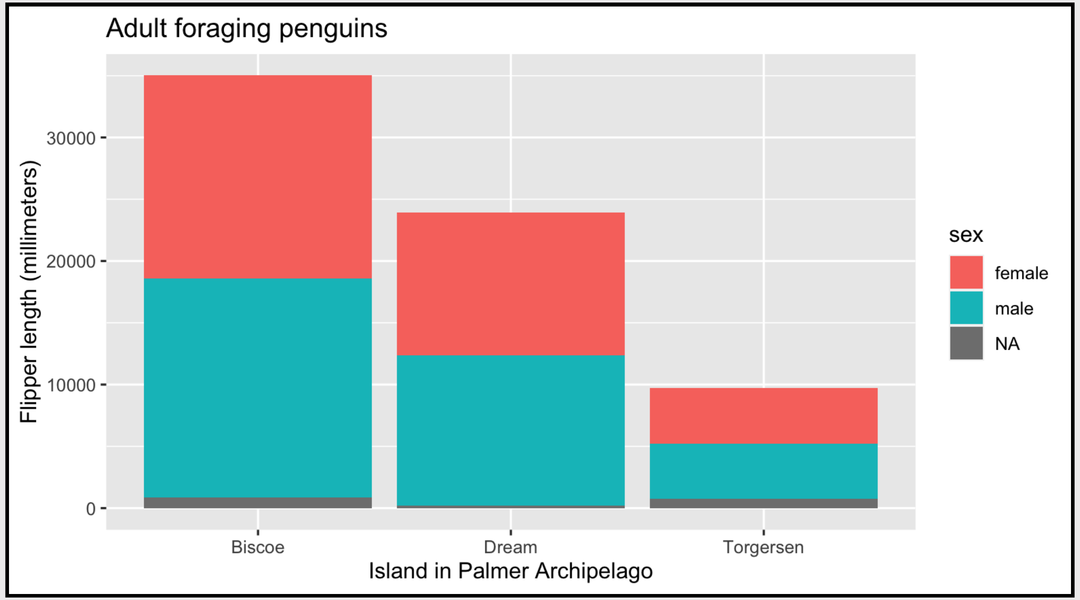
Amounts: *Stacked Bars*

Map `island` to the `x` axis, `flipper_length_mm` to the `y` axis, `sex` to `fill`, the `geom_bar()` layer (with `position` and `stat`), and add the labels

```
geom_bar_stacked_2 <- labs(
  x = "Island in Palmer Archipelago",
  y = "Flipper length (millimeters)",
  title = "Adult foraging penguins")
```

```
ggplot(data = penguins,
      aes(x = island,
          y = flipper_length_mm,
          fill = sex)) +
# use this to determine how many
# sex values are NA (and in what
# categories)
    geom_bar(position = "stack",
             stat = "identity") +
    geom_bar_stacked_2
```



Amounts: *Diverging Bars*

If you have a numeric variable with positive and negative values, consider using diverging bars with `geom_bar()`

Amounts: *Diverging Bars*

```
unisex_names <- fivethirtyeight::unisex_names
unisex_names_diff <- mutate(unisex_names,
     male_female_diff = male_share - female_share,
     diff_cat = if_else(
                  male_female_diff > 0,
                  true = "More common male name",
                  false = "More common female name"))
sample_names <- slice_sample(unisex_names_diff, n = 10)
```

name	total	male_share	female_share
<chr>	<dbl>	<dbl>	<dbl>
Arlyn	2893.9450	0.4542508	0.5457492
Climmie	315.6609	0.4041645	0.5958355
Lakota	2298.5453	0.4711561	0.5288439
Kimoni	323.5975	0.5977501	0.4022499
Chi	1000.5135	0.4465620	0.5534380
Kerry	88963.9263	0.4839488	0.5160512
Tajai	298.6583	0.5123997	0.4876003
Celester	208.2605	0.4862025	0.5137975
Jessie	136381.8307	0.4778343	0.5221657
Rian	6139.8512	0.5936773	0.4063227

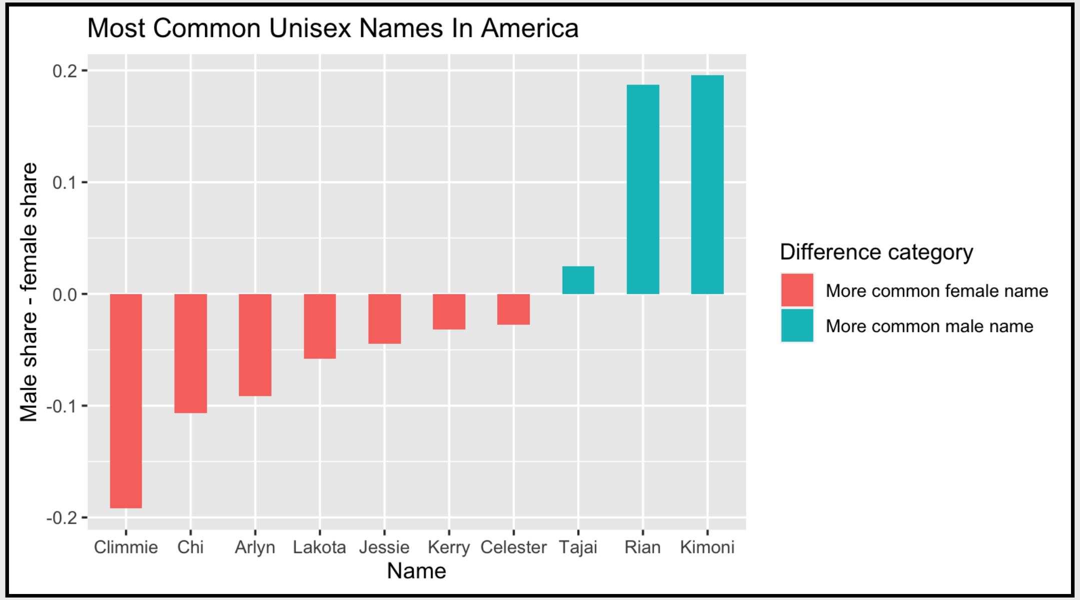
1-10 of 10 rows | 1-4 of 7 columns

Amounts: *Diverging Bars*

Here we use the `reorder()` function to arrange the values of `male_female_diff` by `name`, and map the `diff_cat` to `label`.

```
labs_geom_bar_diverg <- labs(
  x = "Name",
  y = "Male share - female share",
  title = "Most Common Unisex Names In America",
  fill = "Difference category")
```

```
ggplot(data = sample_names,
      aes(x = reorder(x = name,
               male_female_diff),
      # reorder this by x
      y =  male_female_diff,
      label = diff_cat)) +
  geom_bar(
      aes(fill = diff_cat),
          stat = "identity",
         width = .5) +
  labs_geom_bar_diverg
```



Amounts: *Diverging Bars (vertical)*

```
unisex_names <- fivethirtyeight::unisex_names
unisex_names_diff <- mutate(unisex_names,
       male_female_diff = male_share - female_share,
       diff_cat = if_else(male_female_diff > 0,
                          true = "More common male name",
                          false = "More common female name"))
sample_names <- slice_sample(unisex_names_diff, n = 20)
```

name <chr>	total <dbl>	male_share <dbl>	female_share <dbl>
Lyrick	191.6461	0.4766661	0.5233339
Jimi	1666.0126	0.6374152	0.3625848
Soua	157.7697	0.3455958	0.6544042
Zekiah	206.4312	0.6296670	0.3703330
Ramey	811.4974	0.5860682	0.4139318
Riely	348.9562	0.5020881	0.4979119
Toy	1108.9420	0.4190504	0.5809496
Vertis	483.0737	0.6648325	0.3351675
Skylur	108.9681	0.6266535	0.3733465
Adrean	1069.9825	0.6277582	0.3722418

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Amounts: *Diverging Bars (vertical)*

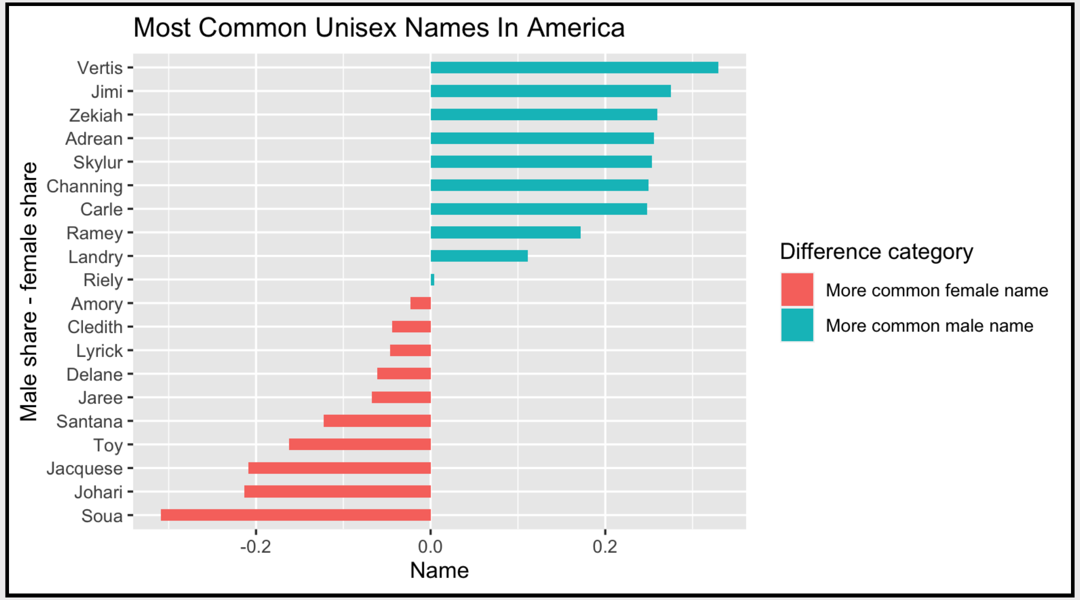
Diverging bar-charts can be arranged vertically, too

Amounts: *Diverging Bars (vertical)*

For vertically arranged bars, we switch the `x` and `y` axis variables (and the `reorder()` function).

```
labs_geom_bar_diverg_vert <- labs(
  x = "Name",
  y = "Male share - female share",
  title = "Most Common Unisex Names In America",
  fill = "Difference category")
```

```
ggplot(data = sample_names,
      aes(x = male_female_diff,
      # reorder this by x
      y =  reorder(x = name,
               male_female_diff),
      label = diff_cat)) +
  geom_bar(
      aes(fill = diff_cat),
          stat = "identity",
         width = .5) +
  labs_geom_bar_diverg_vert
```


Most Common Unisex Names In America
Vertis
Jimi
Zekiah
Adrean
Skylur
Channing
Carle
Ramey
Landry
Riely
Amory
Cledith
Lyrick
Delane
Jaree
Santana
Toy
Jacquese
Johari
Soua
Male share - female share
Name
Difference category
🟥 More common female name
🟩 More common male name