Introduction to the 2018 election data

INTERACTIVE DATA VISUALIZATION WITH PLOTLY IN R

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The 2018 election

- 435 seats in the House of Representatives
- 35 seats in the Senate
- 36 governors

Democrats

- Recoup losses
- Energize voters
- Take control of legislative branch

Republicans

- Keep voters engaged
- Strengthen their position
- Maintain momentum

Voter turnout

McDonald, Michael P. 2018. "2018 November General Election Turnout Rates" United States Elections Project. Accessed Nov. 12, 2018.

```
glimpse(turnout)
```

```
Observations: 51
Variables: 7
$ state       <fct> Alabama, Alaska, Arizona, Arkansas, California, ...
$ state.abbr  <fct> AL, AK, AZ, AR, CA, CO, CT, DE, DC, FL, GA, HI, ...
$ turnout2018 <dbl> 0.474, 0.537, 0.486, 0.412, 0.478, 0.619, 0.526,...
$ turnout2014 <dbl> 0.332, 0.548, 0.341, 0.403, 0.307, 0.547, 0.425,...
$ ballots     <int> 1725000, 280000, 2385000, 895000, 12250000, 2540...
$ vep         <int> 3641209, 521777, 4910625, 2171940, 25635139, 410...
$ vap         <int> 3802714, 554426, 5519036, 2319740, 30836229, 444...
```

Fundraising

```
glimpse(fundraising)
```

```
Observations: 2,412
Variables: 13
$ name          <fct> CUMMINGS, ELIJAH E, BROWN, ALVIN, ANGLE, SHARRON E, S...
$ id            <fct> H6MD07160, H8FL05140, H6NV02172, H2IL20042, H2PA15099...
$ office        <fct> H, H, H, H, H, H, H, H, H, H, H, H, H, H, H, H, H, H,...
$ state         <fct> MD, FL, NV, IL, PA, NJ, NH, AZ, KS, FL, MT, NC, CA, N...
...
$ receipts      <dbl> 944365.35, 450694.05, 52390.03, 1890067.19, 3926.00, ...
$ disbursement <dbl> 1051584.48, 447395.51, 34936.59, 1567978.53, 4705.16,...
$ cash.on.hand <dbl> 847733.69, 3298.54, 17568.45, 1158378.38, 64.36, -299...
$ debt.owed     <dbl> 0.00, 0.00, 0.00, 0.00, 0.00, 0.00, 314610.47, 0.00, ...
$ end.date      <fct> 10/17/18, 9/30/18, 9/30/18, 10/17/18, 9/30/18, 10/19/...
$ start.date    <fct> 1/1/17, 1/1/18, 10/1/17, 1/1/17, 1/1/17, 2/18/17, 4/1...
```

Congressional results

```
glimpse(senate_winners)
```

```
Observations: 33
Variables: 7
$ name      <fct> SINEMA, KYRSTEN, FEINSTEIN, DIANNE, MURPHY, CHRISTOPH...
$ id        <fct> S8AZ00197, S0CA00199, S2CT00132, S8DE00079, S8FL00273...
$ state     <fct> AZ, CA, CT, DE, FL, HI, IN, MA, MD, ME, MI, MN, MO, M...
$ party     <fct> DEM, DEM, DEM, DEM, REP, DEM, REP, DEM, DEM, IND, DEM...
$ incumbent <fct> OPEN, INCUMBENT, INCUMBENT, INCUMBENT, CHALLENGER, IN...
$ votes     <int> 938976, 4777661, 818614, 217358, 4097689, 276133, 115...
$ pct.vote  <dbl> 48.87364, 54.44503, 59.42544, 61.31725, 50.07701, 71....
```

Let's explore

INTERACTIVE DATA VISUALIZATION WITH PLOTLY IN R

Choropleth maps

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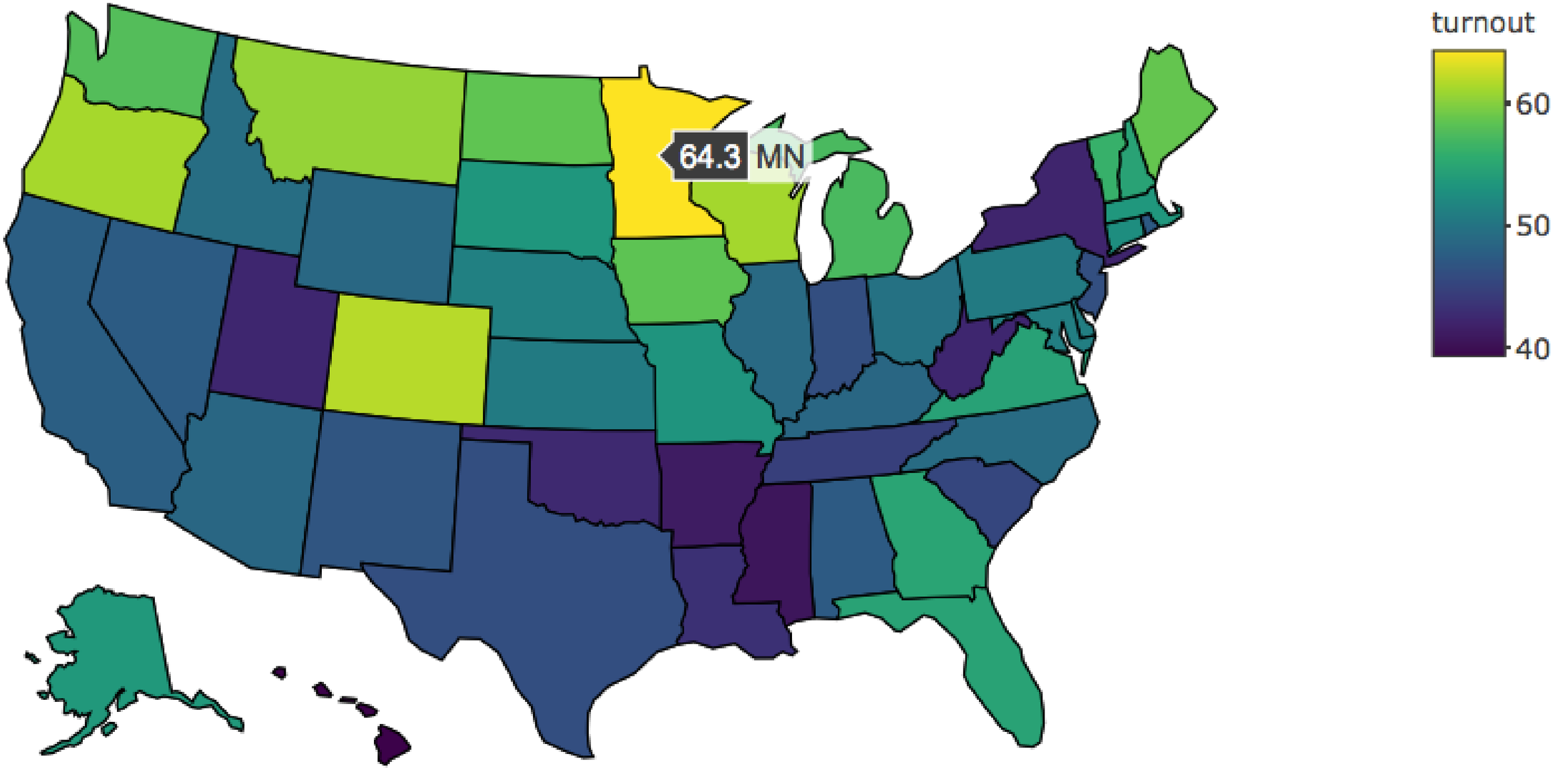
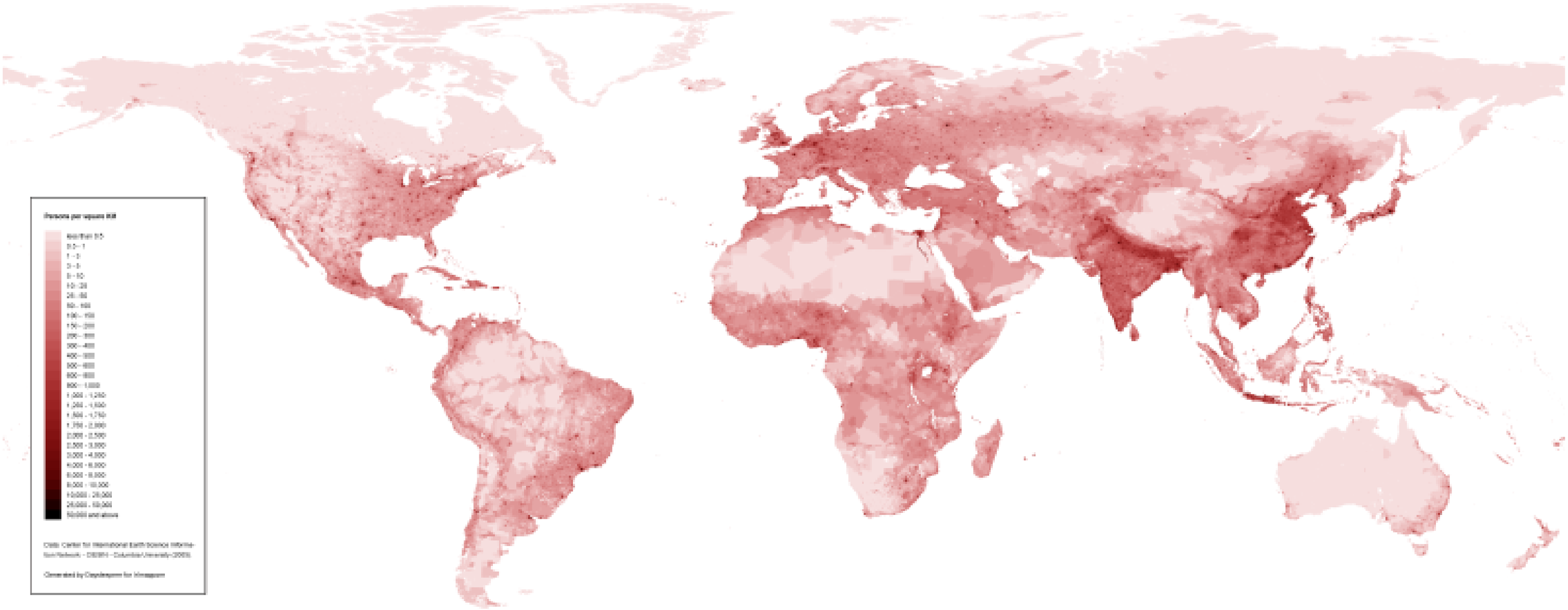

turnout
60
50
40
64.3 MN


Persons per square KM
Less than 0.5
0.5 - 1
1 - 5
5 - 10
10 - 25
25 - 50
50 - 100
100 - 150
150 - 200
200 - 300
300 - 400
400 - 500
500 - 600
600 - 800
800 - 1,000
1,000 - 1,250
1,250 - 1,500
1,500 - 1,750
1,750 - 2,000
2,000 - 2,500
2,500 - 3,000
3,000 - 4,000
4,000 - 5,000
5,000 - 6,000
6,000 - 10,000
10,000 - 25,000
25,000 - 50,000
50,000 and above

Choropleth maps in plotly

```
head(turnout)
```

```
       state state.abbr turnout2018 turnout2014  ballots      vep      vap
1    Alabama         AL        0.474        0.332  1725000  3641209  3802714
2     Alaska         AK        0.537        0.548   280000   521777   554426
3    Arizona         AZ        0.486        0.341  2385000  4910625  5519036
4   Arkansas         AR        0.412        0.403   895000  2171940  2319740
5 California         CA        0.478        0.307 12250000 25635139 30836229
6   Colorado         CO        0.619        0.547  2540000  4103903  4445013
```

Choropleth maps in plotly

```
turnout %>%

  plot_geo(locationmode = 'USA-states') %>%

  add_trace(
    z = ~turnout,                    # Sets the color values
    locations = ~state.abbr          # Matches cases to polygons
  ) %>%

  layout(geo = list(scope = 'usa')) # Restricts map only to USA
```

Limitation of plot_geo()

locationmode: `"USA-states" | "ISO-3" | "country names"`

Mapping options

`scope = "usa"`

- "world" | "usa" | "europe" | "asia" | "africa" | "north america" | "south america"

`projection = list(type = "mercator")`

- "conic conformal" | "mercator" | "robinson" | "stereographic" | and 18 more...

`scale = 1`

- Larger values = tighter zoom

`center = list(lat = ~c.lat, lon = ~c.lon)`

- Set `c.lat` and `c.lon` to center the map

Let's get mapping!

INTERACTIVE DATA VISUALIZATION WITH PLOTLY IN R

From polygons to maps

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Boundaries

```
head(us_states)
```

```
      long      lat group order  region
1 -87.46201 30.38968     1     1 alabama
2 -87.48493 30.37249     1     2 alabama
3 -87.52503 30.37249     1     3 alabama
4 -87.53076 30.33239     1     4 alabama
5 -87.57087 30.32665     1     5 alabama
6 -87.58806 30.32665     1     6 alabama
```

Joining data frames

```
glimpse(us_states)
```

```
Observations: 15,537
Variables: 5
$ long   <dbl> -87.46201, -87.48493, -87.52503,
$ lat    <dbl> 30.38968, 30.37249, 30.37249, ...
$ group  <dbl> 1, 1, 1, ...
$ order  <int> 1, 2, 3, ...
$ region <chr> "alabama", "alabama", "alabama",
```

```
glimpse(turnout)
```

```
Observations: 51
Variables: 7
$ state       <fct> Alabama, Alaska, Arizona, Ar
$ state.abbr  <fct> AL, AK, AZ, AR, ...
$ turnout2018 <dbl> 0.474, 0.537, 0.486, 0.412,
$ turnout2014 <dbl> 0.332, 0.548, 0.341, 0.403,
$ ballots     <int> 1725000, 280000, 2385000, 89
$ vep         <int> 3641209, 521777, 4910625, 21
$ vap         <int> 3802714, 554426, 5519036, 23
```

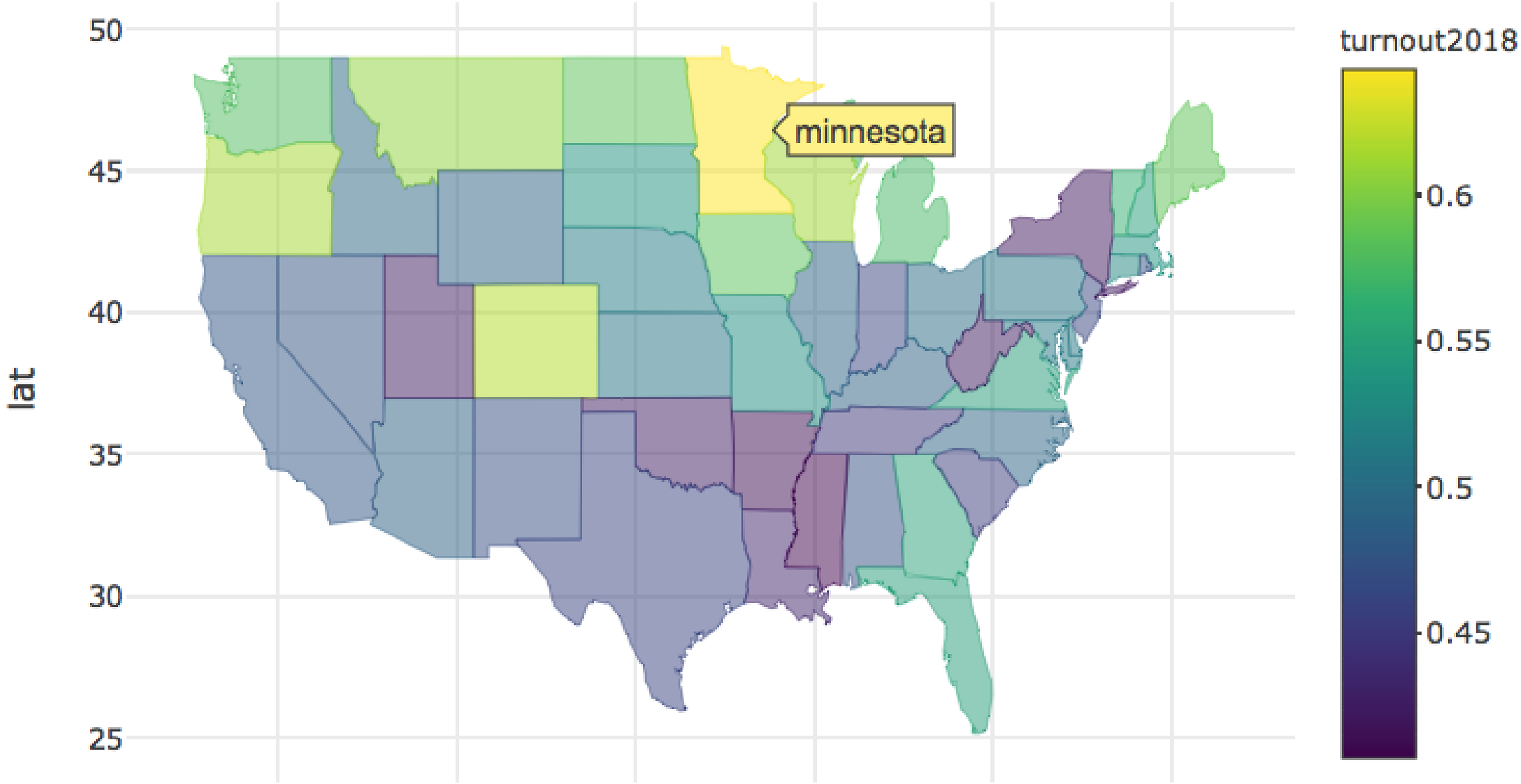
Joining data frames

```
turnout <- turnout %>%
  mutate(state = tolower(state)) # make state names lowercase

states_map <- left_join(us_states, turnout, by = c("region" = "state"))
```

```
Observations: 15,537
Variables: 11
$ long        <dbl> -87.46201, -87.48493, -87.52503, -87.53076...
$ lat         <dbl> 30.38968, 30.37249, 30.37249, 30.33239, 30...
$ group       <dbl> 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, ...
$ order       <int> 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13,...
$ region      <chr> "alabama", "alabama", "alabama", "alabama"...
$ state.abbr  <fct> AL, AL, AL, AL, AL, AL, AL, AL, AL, AL, AL...
$ turnout2018 <dbl> 0.474, 0.474, 0.474, 0.474, 0.474, 0.474, ...
$ turnout2014 <dbl> 0.332, 0.332, 0.332, 0.332, 0.332, 0.332, ...
...
```

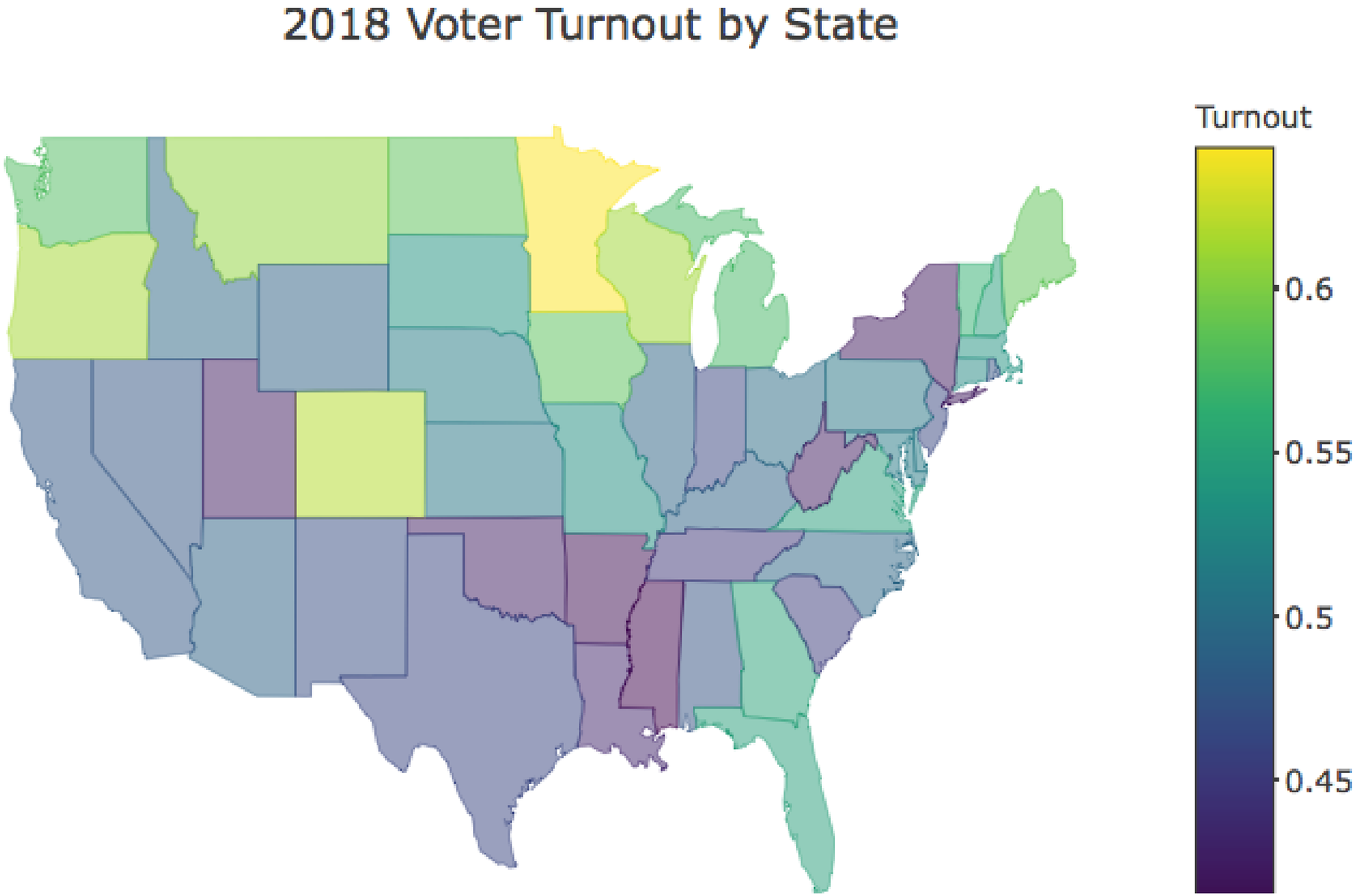
Creating the map

```
states_map %>%
  group_by(group) %>%

  plot_ly(
    x = ~long,
    y = ~lat,
    color = ~turnout2018, # variable mapped to fill color
    split = ~region       # no more than one fill color per polygon
  ) %>%

  add_polygons(
    line = list(width = 0.4),
    showlegend = FALSE
  )
```


50
45
40
35
30
25
lat
minnesota
turnout2018
0.6
0.55
0.5
0.45

Polishing your map

```
state_turnout_map %>%
  layout(
    title = "2018 Voter Turnout by State",
    xaxis = list(title = "", showgrid = FALSE,
                 zeroline = FALSE, showticklabels = FALSE),
    yaxis = list(title = "", showgrid = FALSE,
                 zeroline = FALSE, showticklabels = FALSE)
  ) %>%
  colorbar(title = "Turnout")
```


2018 Voter Turnout by State
Turnout
0.6
0.55
0.5
0.45

Let's practice!

INTERACTIVE DATA VISUALIZATION WITH PLOTLY IN R

Congratulations!

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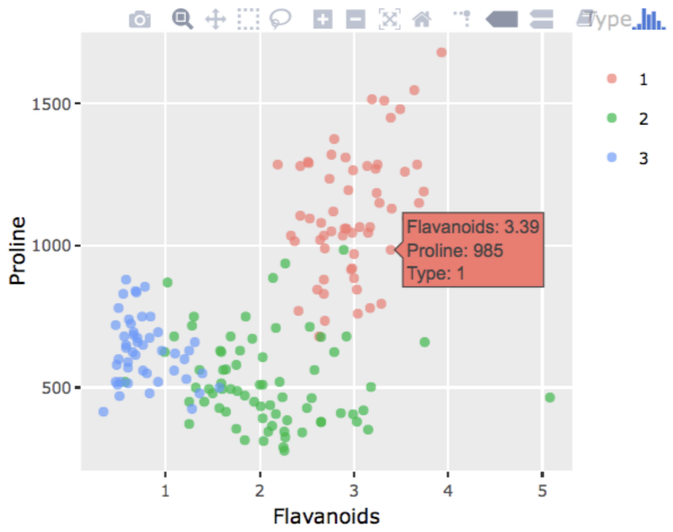
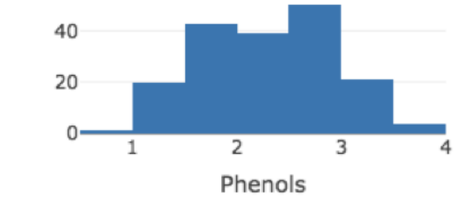
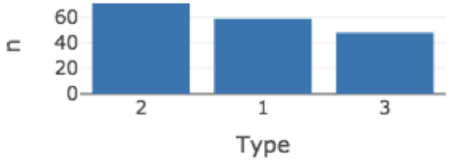
Chapter 1: Displaying distributions

What is plotly?
Converting ggplot2 graphics

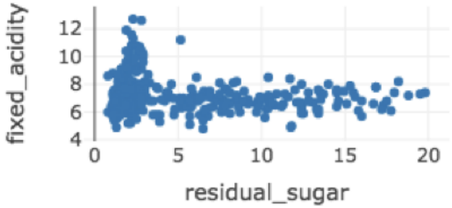


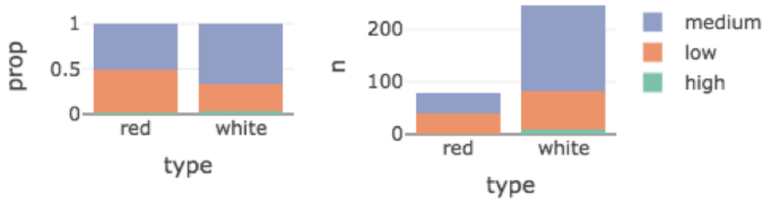
Univariate graphics

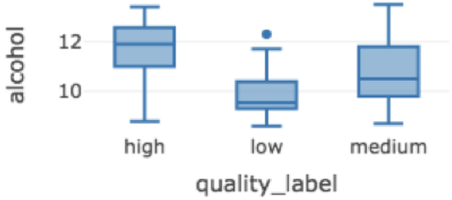




Bivariate graphics

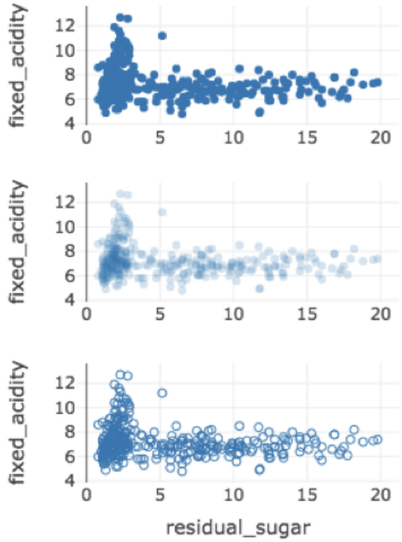




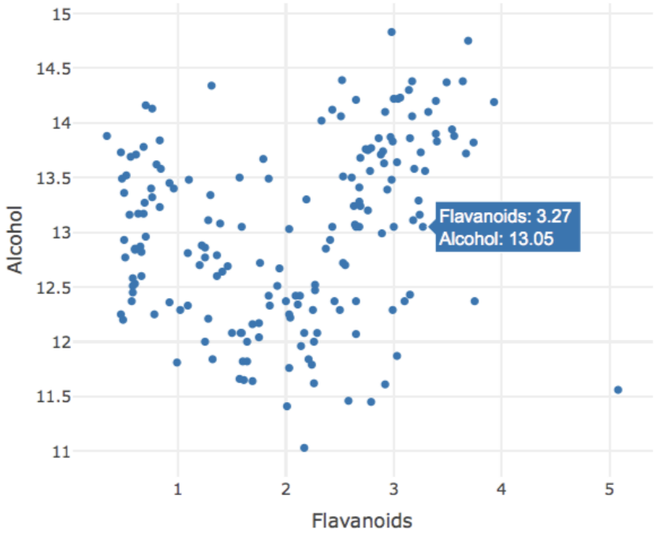


Chapter 2: Customizing your charts

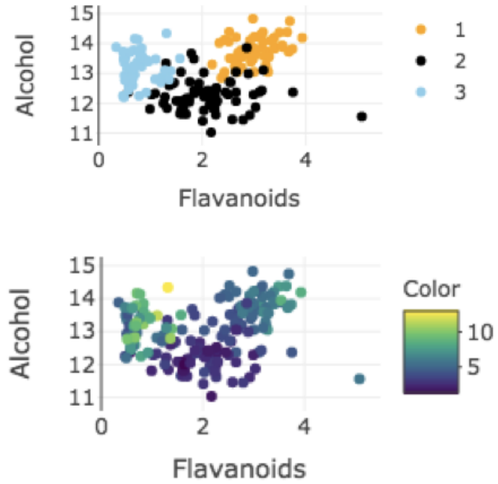
Color, opacity, symbols, and more!



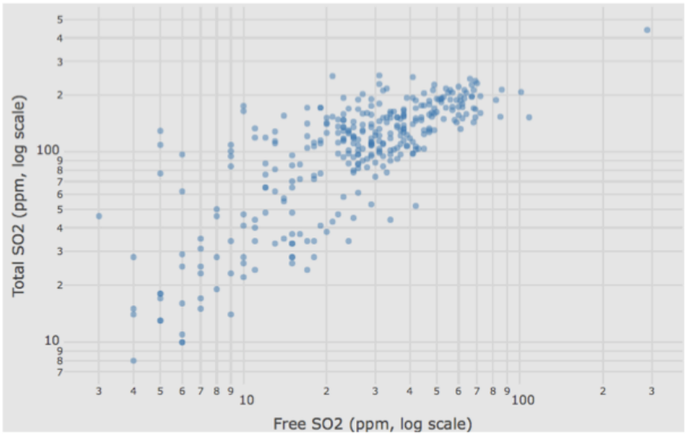
Customizing hover info



Thoughtful use of color

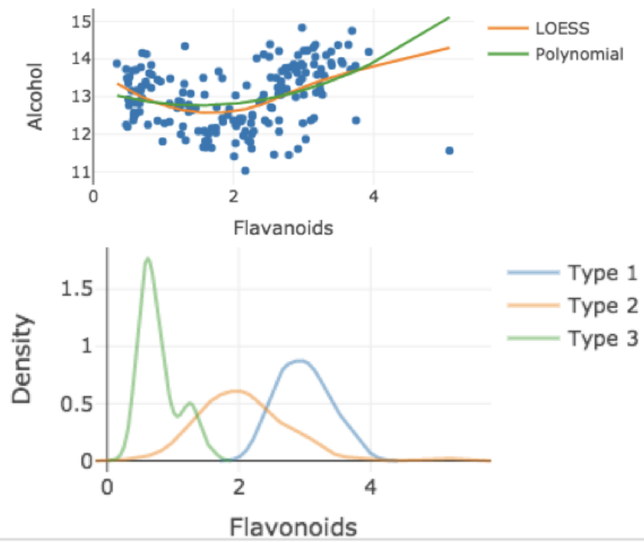


Customizing the layout

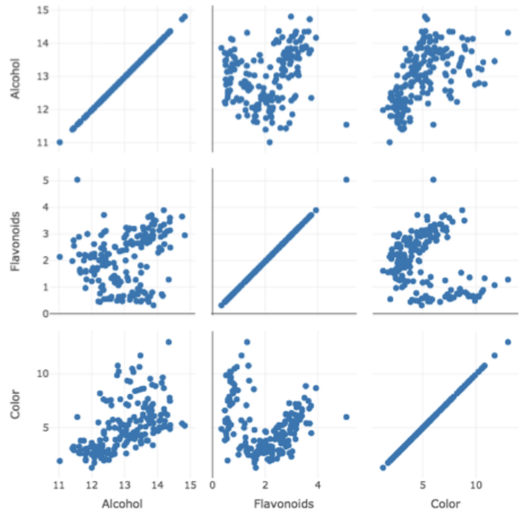


Chapter 3: Advanced charts

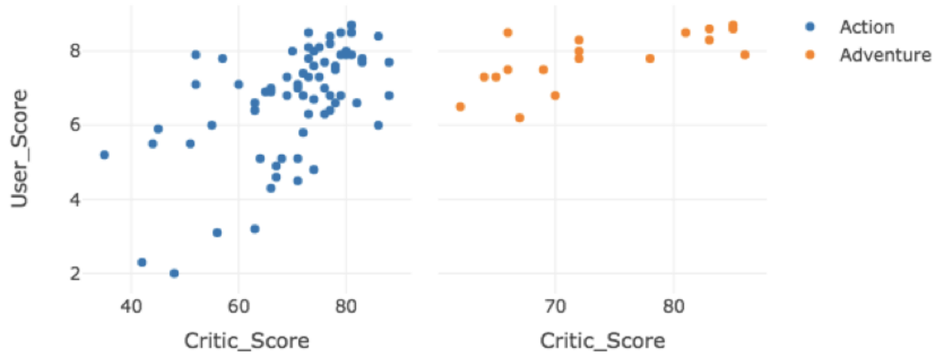
Layer traces to tell more complex stories



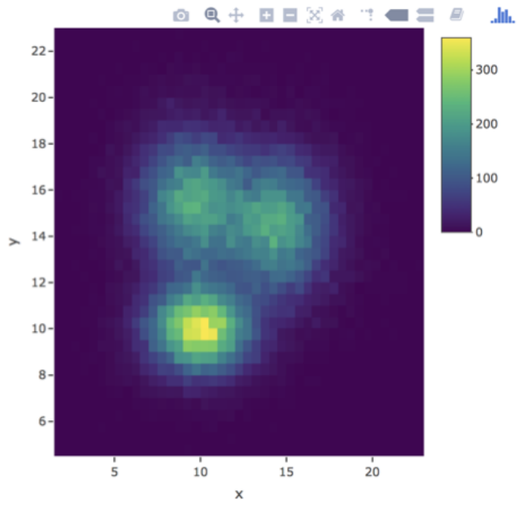
Scatterplot matrices



Subplots (i.e. faceting or small multiples)

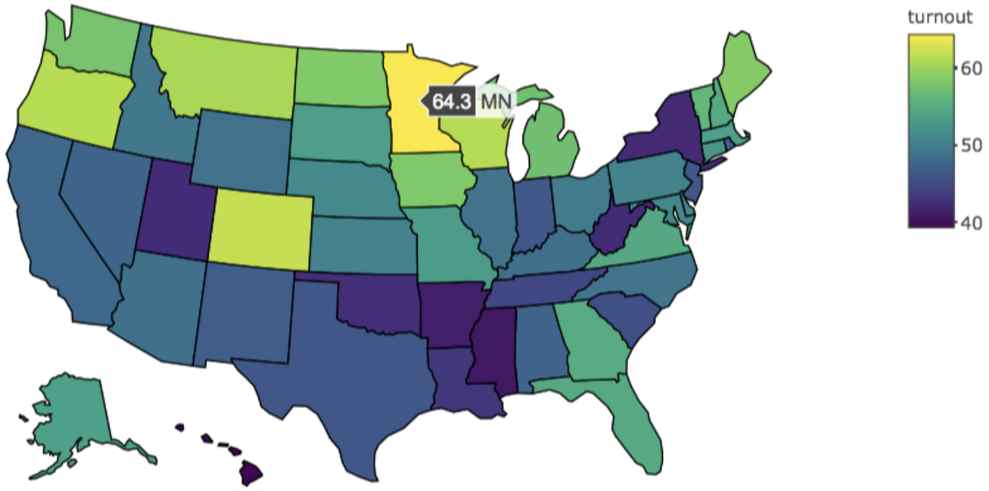


Binned scatterplots



Chapter 4: Mapping data

Choropleth maps



Points on maps

Going further

Books

- Plotly for R by Carson Sievert
- Interactive Graphics for Data Analysis
- Interactive and Dynamic Graphics for Data Analysis

Community

- community.plot.ly don't hesitate to ask the community a question!

Manuals

- plot.ly/r: Quick examples along with in-depth documentation
- plotly cheatsheet

Forging ahead

- Putting your charts online
- Linked and/or animated graphics
- shiny + plot.ly

Thank you!

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