Color in visualizations

IMPROVING YOUR DATA VISUALIZATIONS IN PYTHON

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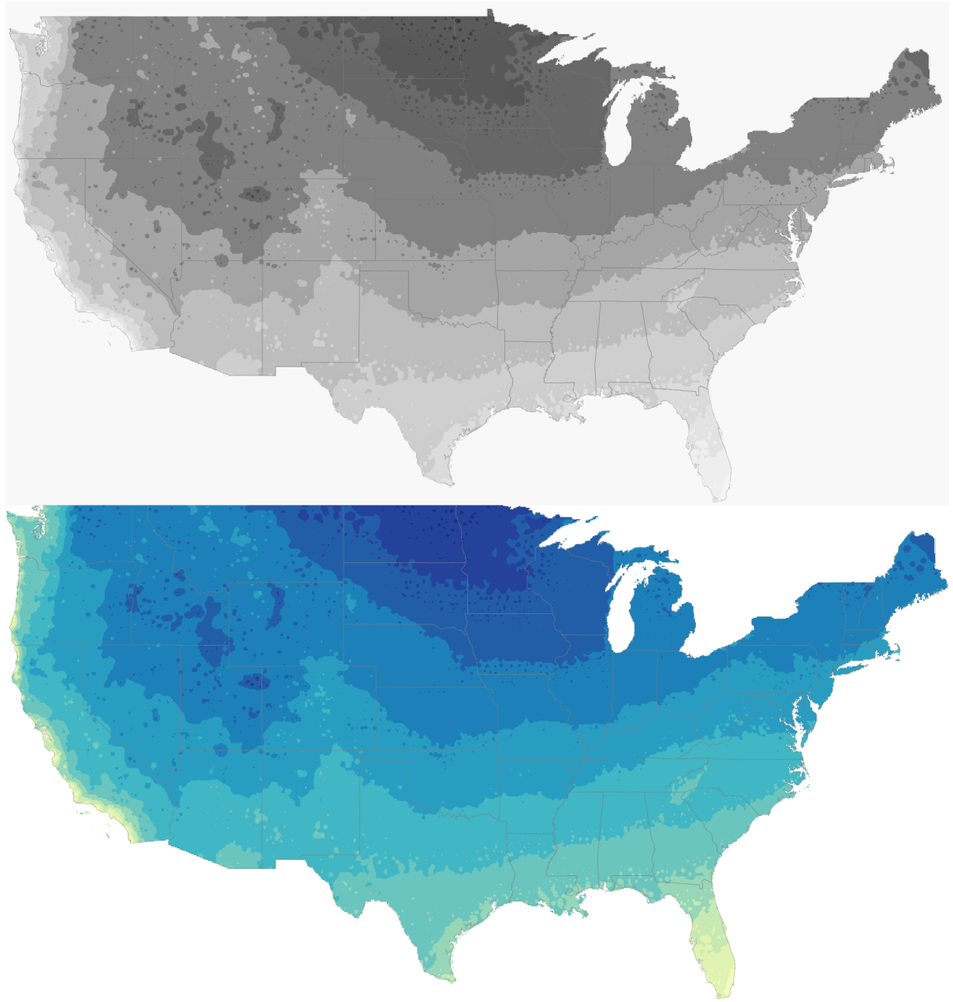
Instructor

How color is used

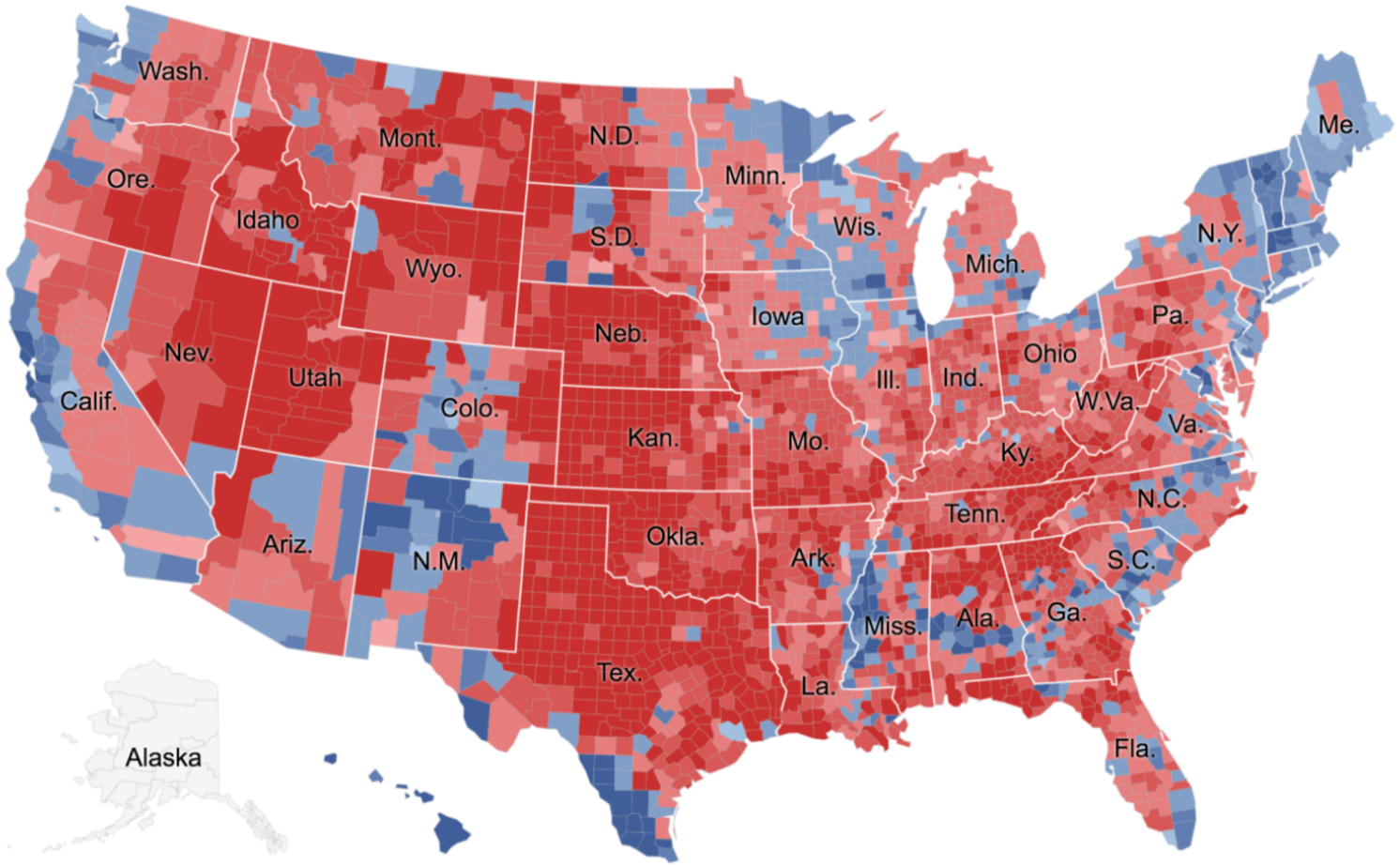
- Differentiates classes of data
- Encodes continuous values
- Should be used *carefully*

Color can be beautiful

- Boring → eye-catching
- Variety is good

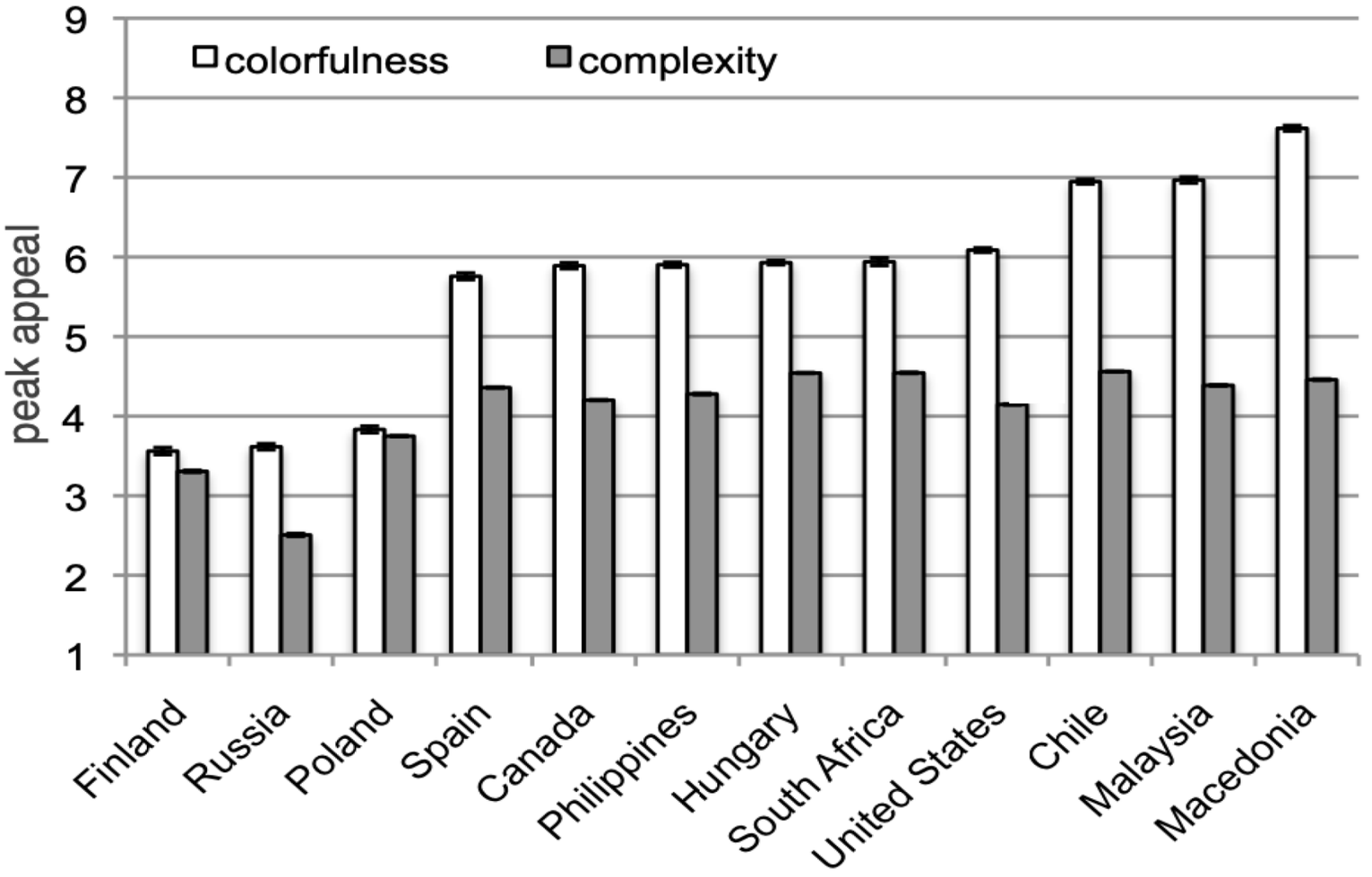


- Meaning is often applied to colors via culture/ personal experience



[1] Parlapiano, A. (2016 November 1) There are many ways to map election results. We've tried most of them. New York Times. Retrieved from https://www.nytimes.com/

Color preferences can vary



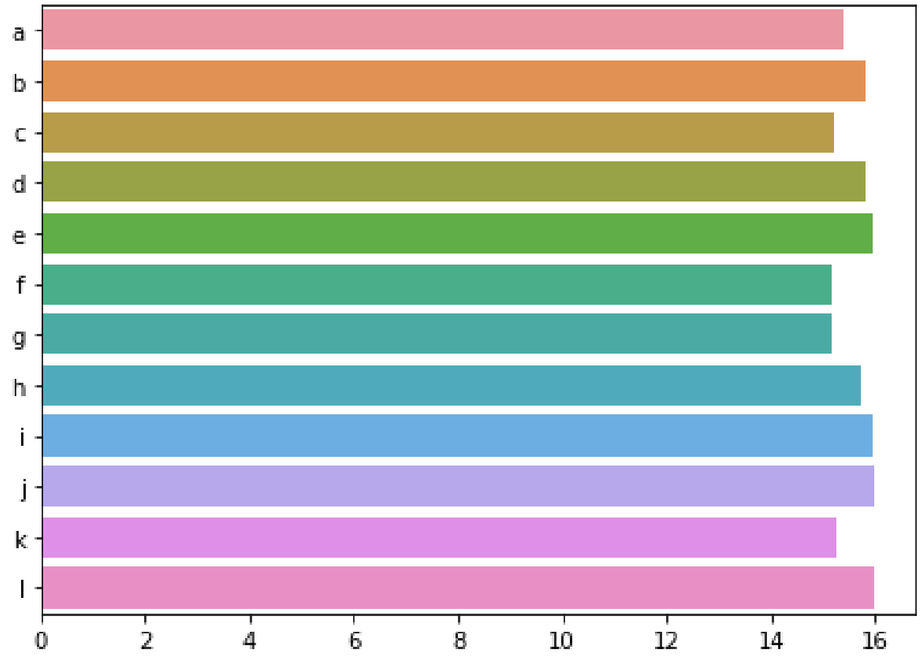
Color can be misleading...

> "It is evident that the color-size illusion is present in a marked degree [no matter what] arrangement."

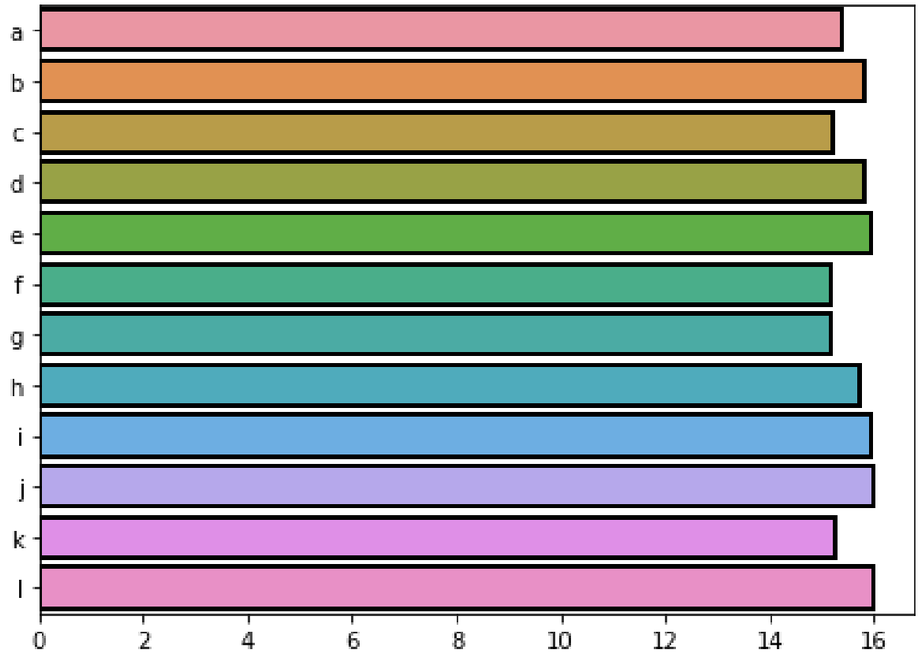
C.J. Warden & E.L. Flynn, 1926

A remedy for the color-size illusion

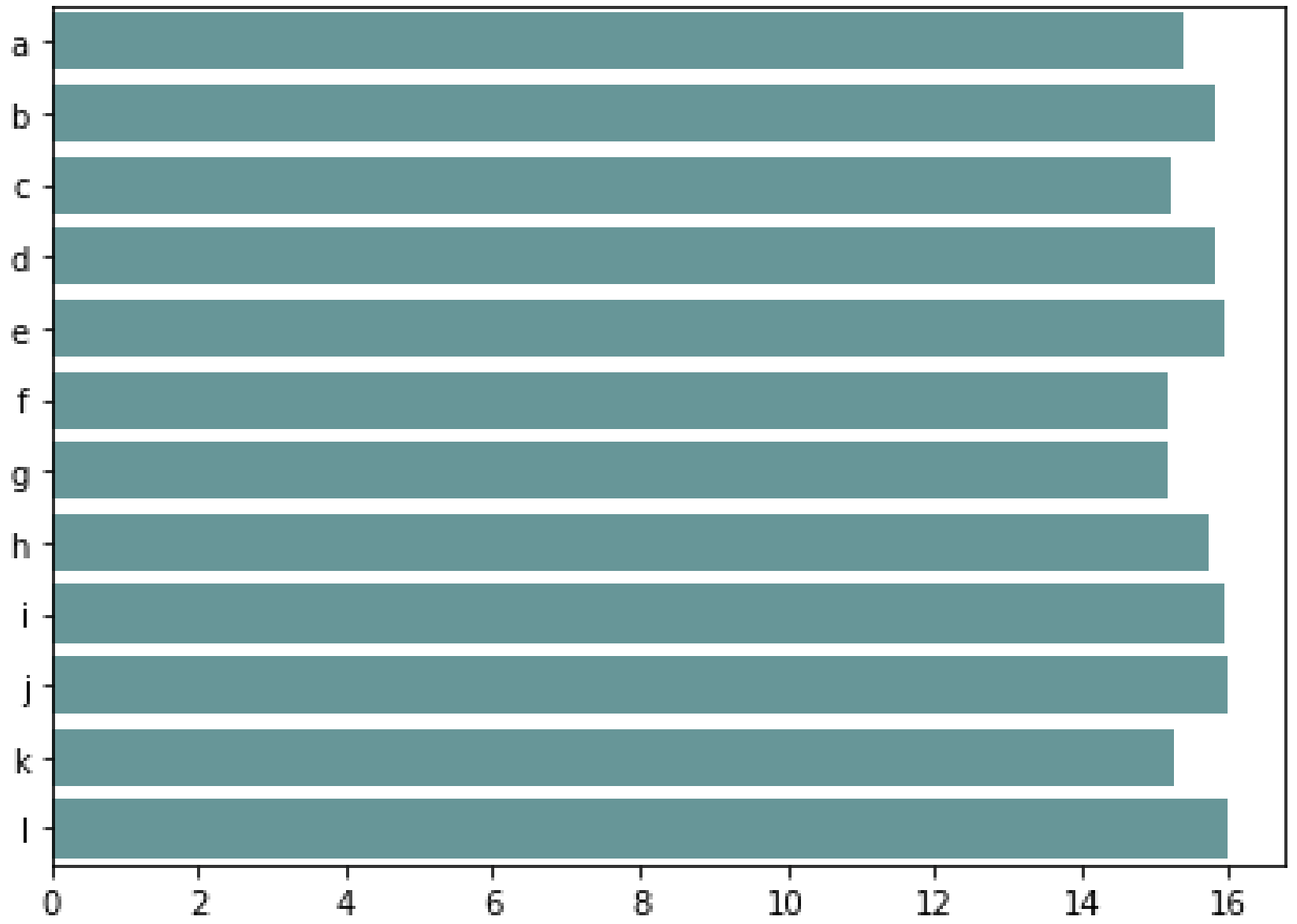
```
sns.barplot(x = values, y = ids)
```




```
sns.barplot(x = values, y = ids,
            edgecolor = 'black')
```



```
sns.barplot(x = values, y = ids, color = 'cadetblue')
```



Let's paint some data!

IMPROVING YOUR DATA VISUALIZATIONS IN PYTHON

Continuous color palettes

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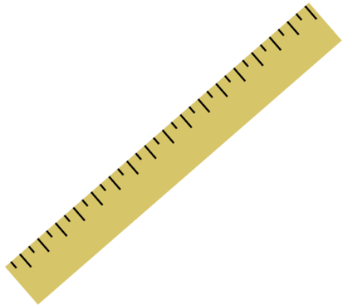
Continuous

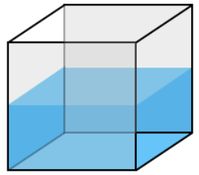
- *Ordered*
- *Lots of possible values*

Distances



Sensor Readings

Volumes

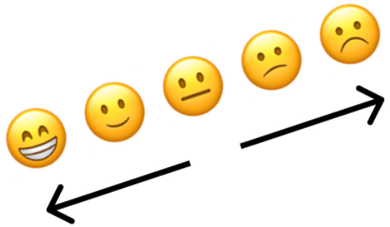


Not Continuous

- *No order or...*
- *Few possible values*

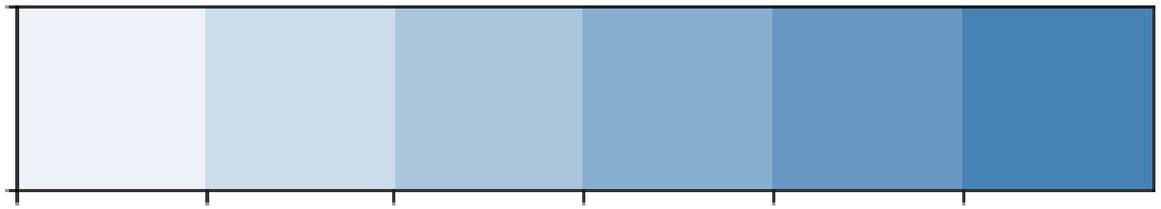
Categories

Relative Scales

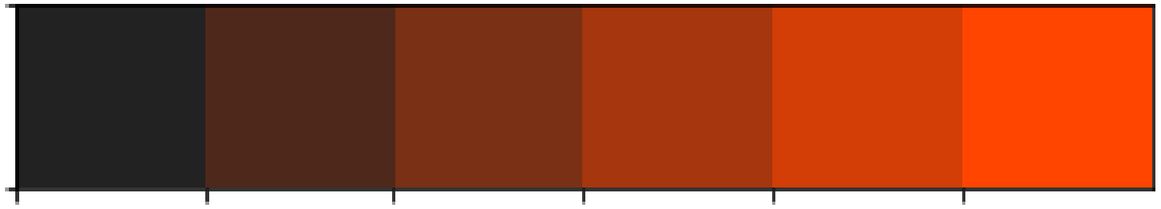


Binary Values

```
blue_scale = sns.light_palette("steelblue")
sns.palplot(blue_scale)
```



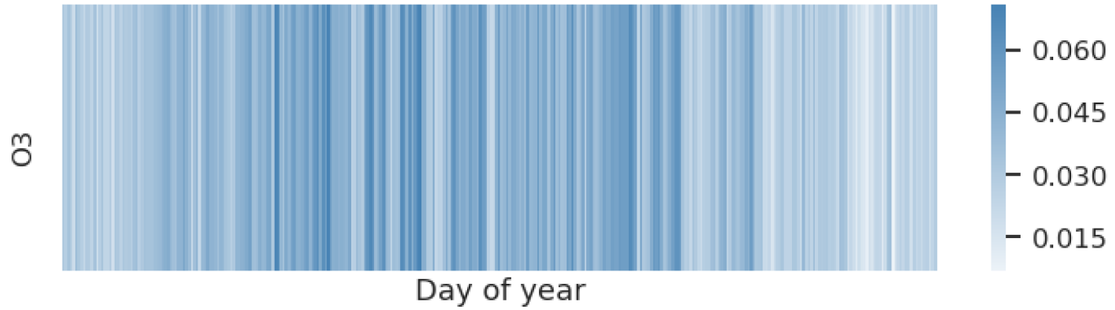
```
red_scale = sns.dark_palette("orangered")
sns.palplot(red_scale)
```



Color is less precise

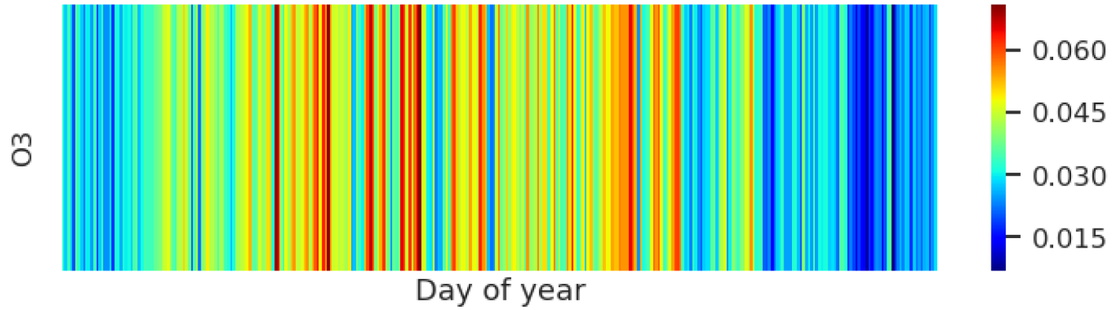
Keep it simple

```
indy_oct = pollution.query("year == 2015 & city == 'Indianapolis'")
blue_scale = sns.light_palette("steelblue", as_cmap = True)
sns.heatmap(indy_oct[['O3']], cmap = blue_scale)
```



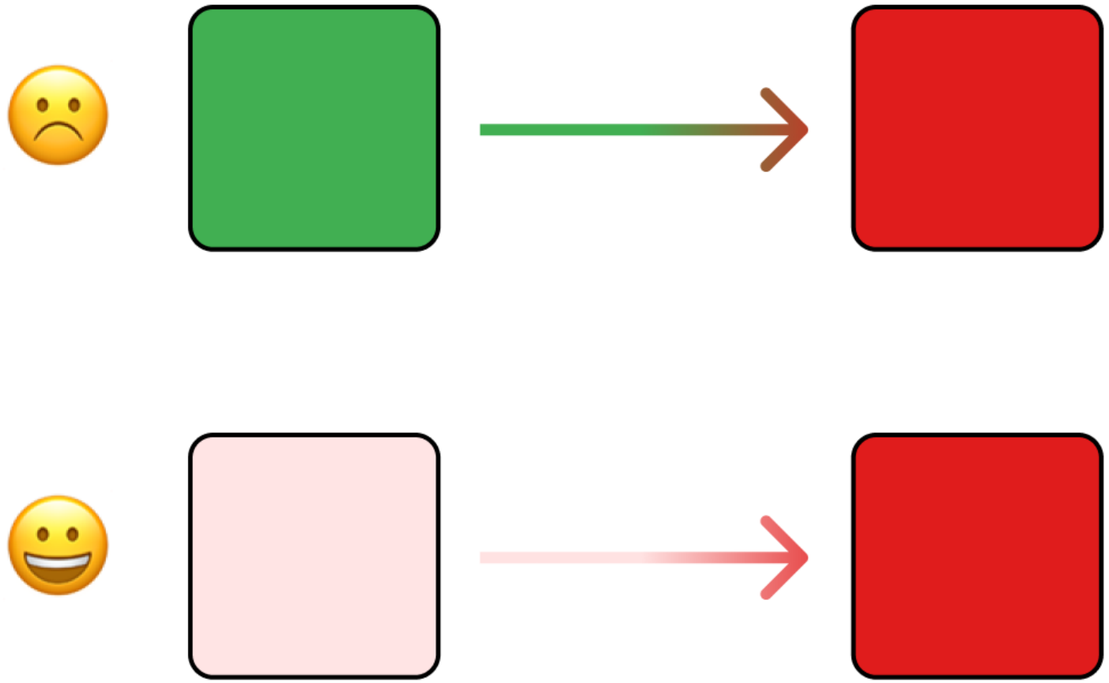
Keep it simple

```
indy_oct = pollution.query("year == 2015 & city == 'Indianapolis'")
jet_scale = palette = sns.color_palette('jet', as_cmap = True)
sns.heatmap(indy_oct[['O3']], cmap = jet_scale)
```



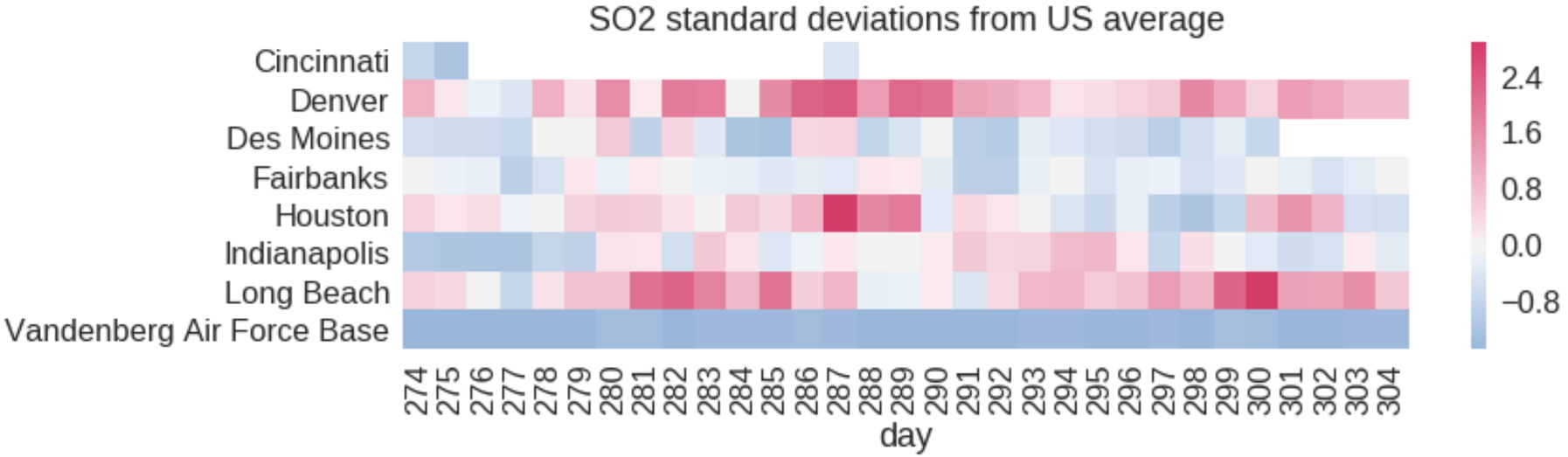
Be aware of color blindness

- Avoid transitions between green and red
- Palettes that use intensity are safer



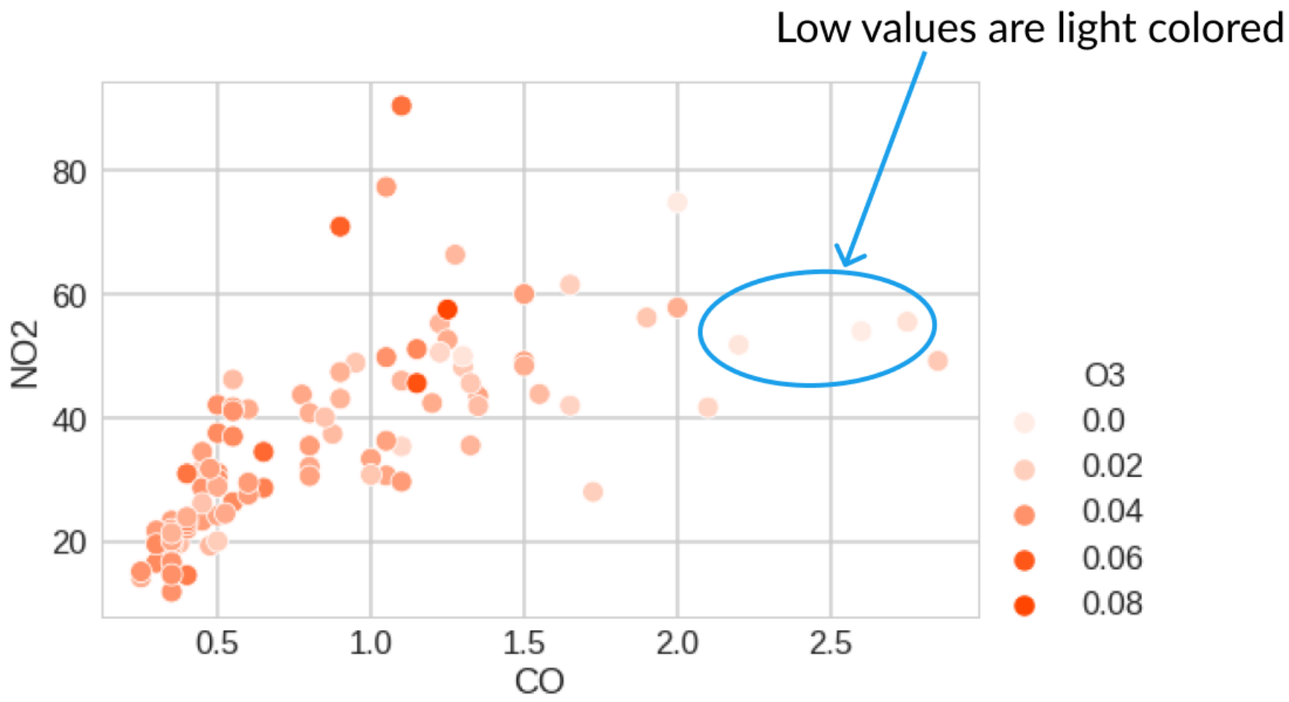
Encoding neutral values

```
pal_light = sns.diverging_palette(250, 0)
pal_dark  = sns.diverging_palette(250, 0, center = 'dark')
```



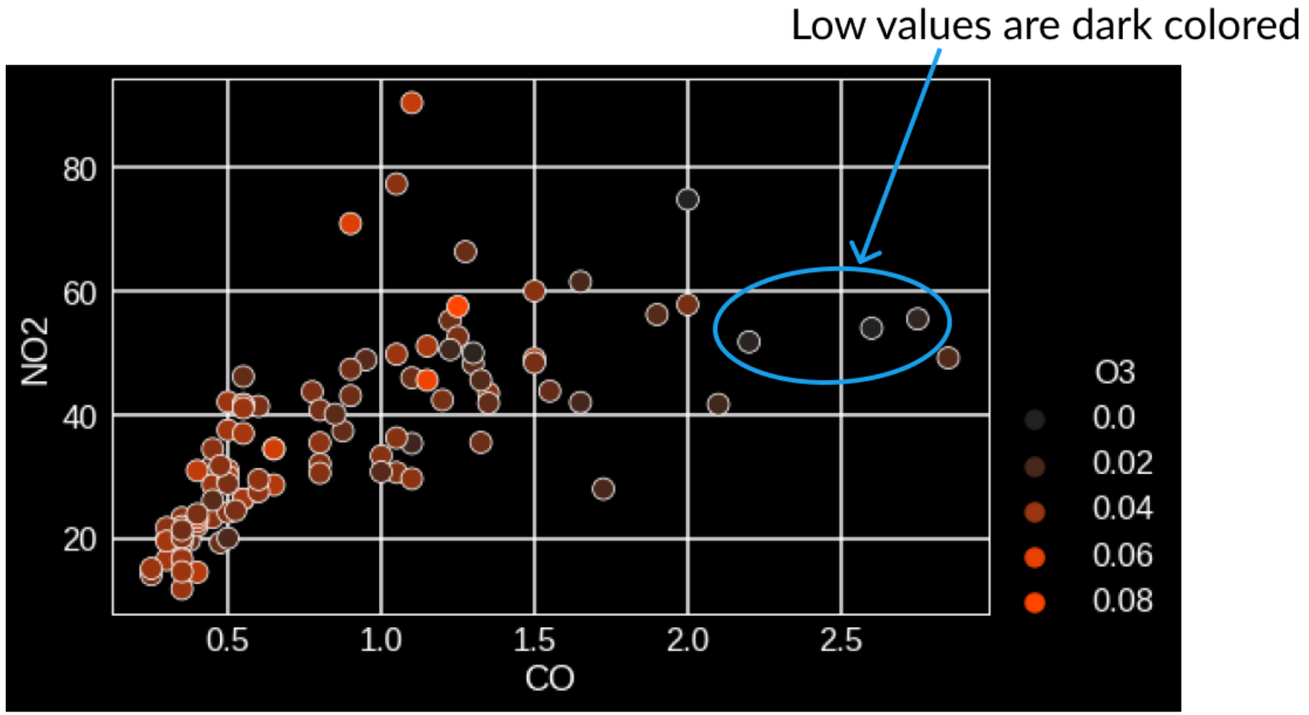
```
plt.style.use('seaborn-white')

light_palette = sns.light_palette("orangered")
sns.scatterplot(x = 'CO', y = 'NO2', hue = 'O3', data = lb_2012,
                palette = light_palette)
```



```
plt.style.use('dark_background')

dark_palette = sns.dark_palette("orangered")
sns.scatterplot(x = 'CO', y = 'NO2', hue = 'O3', data = lb_2012,
                palette = dark_palette)
```



Let's continue in the exercises

IMPROVING YOUR DATA VISUALIZATIONS IN PYTHON

Categorical palettes

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Categorical Data

Cities

Cincinnati
Denver
Des Moines
Fairbanks
Houston
Indianapolis
Long Beach
Vandenberg Air Force Base

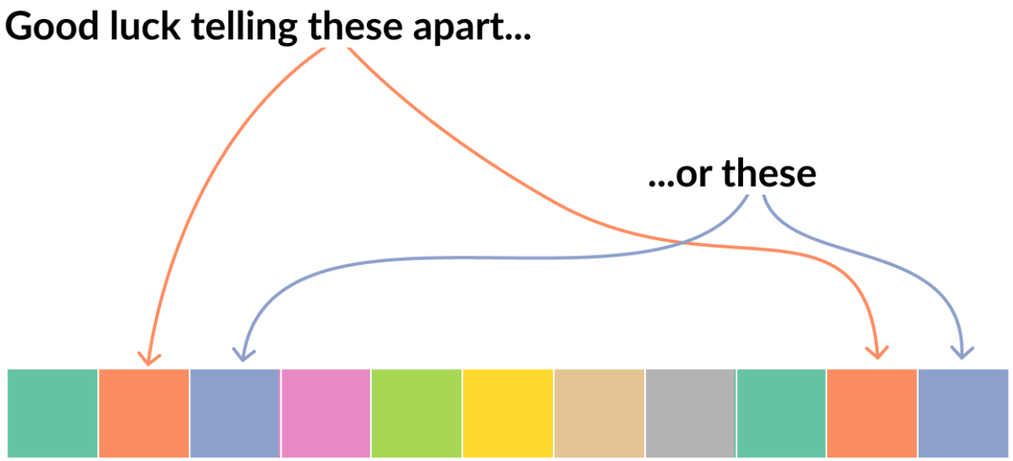
Countries

Bird Species

Limits in perception

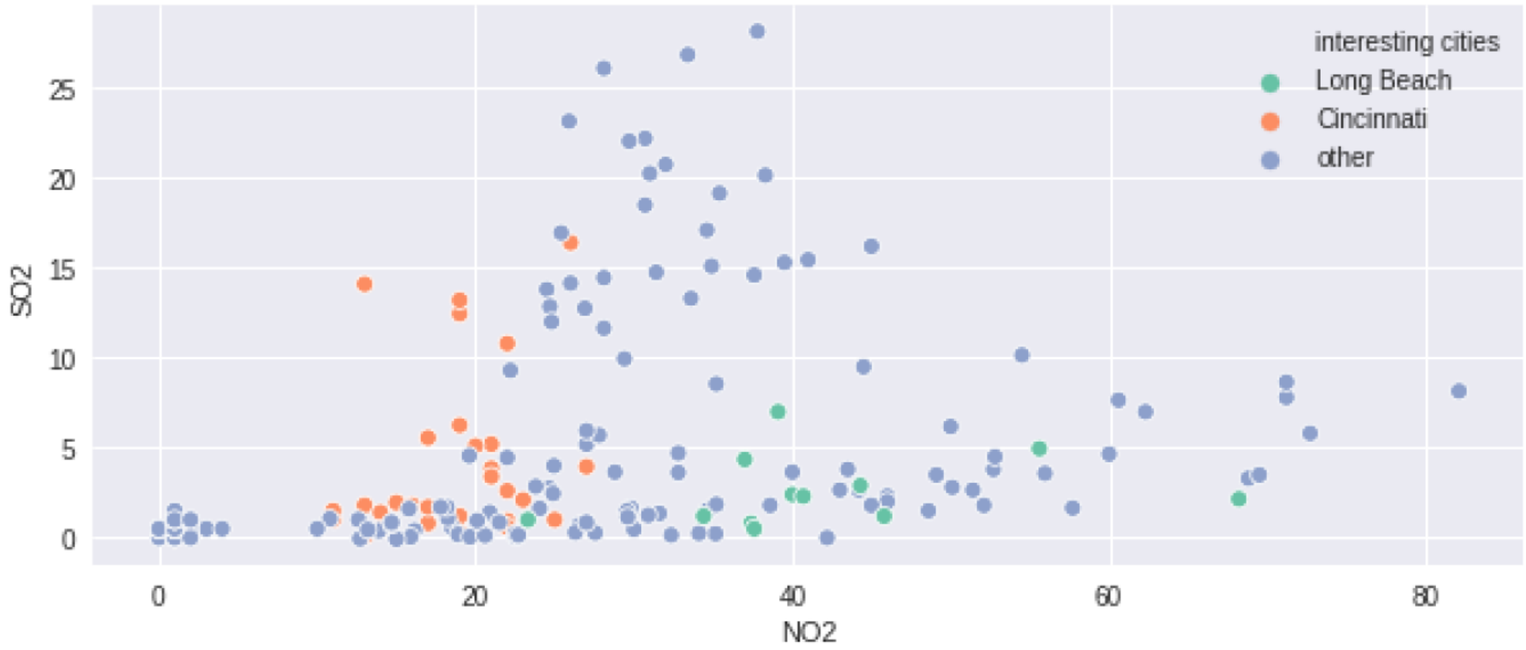
- Try and limit to 10 or fewer categories
- Keep color-blindness in mind

```
sns.palplot(sns.color_palette('Set2', 11))
```



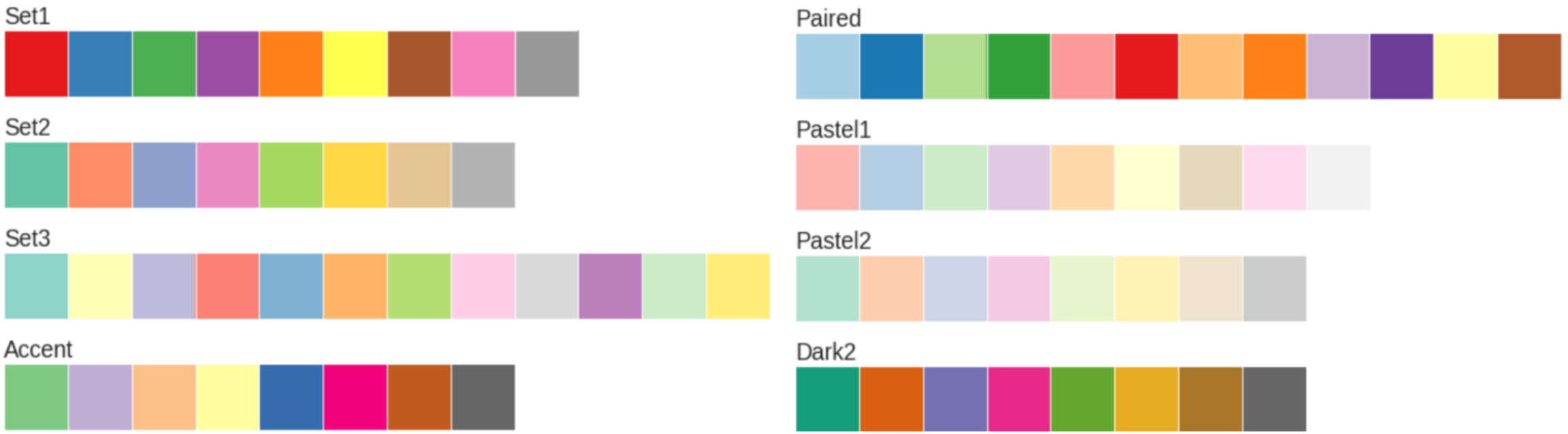
```
# Assign a new column to dataframe the desired combos
pollution['interesting cities'] = [x if x in ['Long Beach', 'Cincinnati']
                                   else 'other' for x in pollution['city'] ]

sns.scatterplot(x="NO2", y="SO2", hue = 'interesting cities', palette='Set2',
                data=pollution.query('year == 2014 & month == 12'))
```



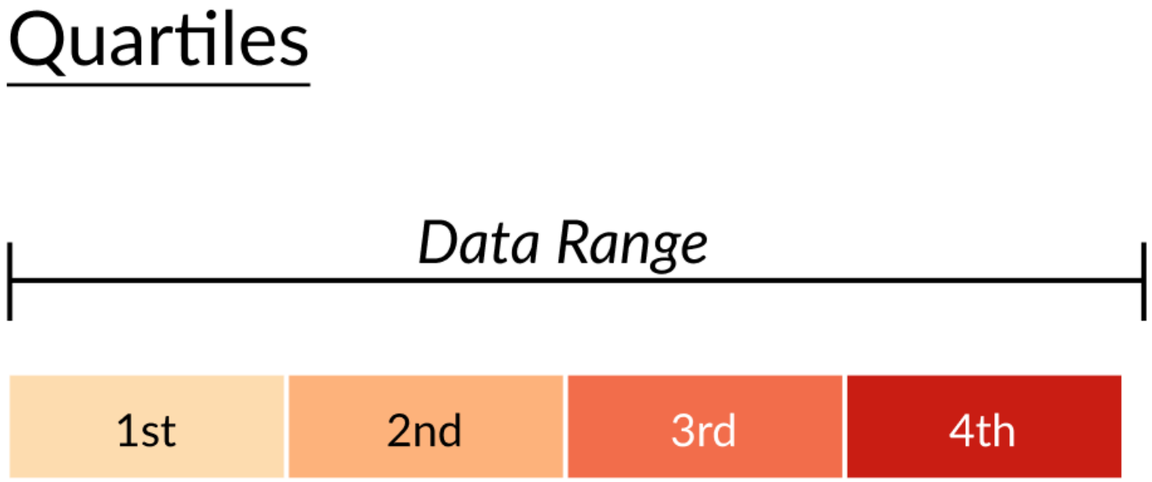
```
colorbrewer_palettes = ['Set1',   'Set2',    'Set3',    'Accent',
                        'Paired', 'Pastel1', 'Pastel2', 'Dark2']

for pal in colorbrewer_palettes:
    sns.palplot(pal=sns.color_palette(pal))
    plt.title(pal, loc = 'left')
```



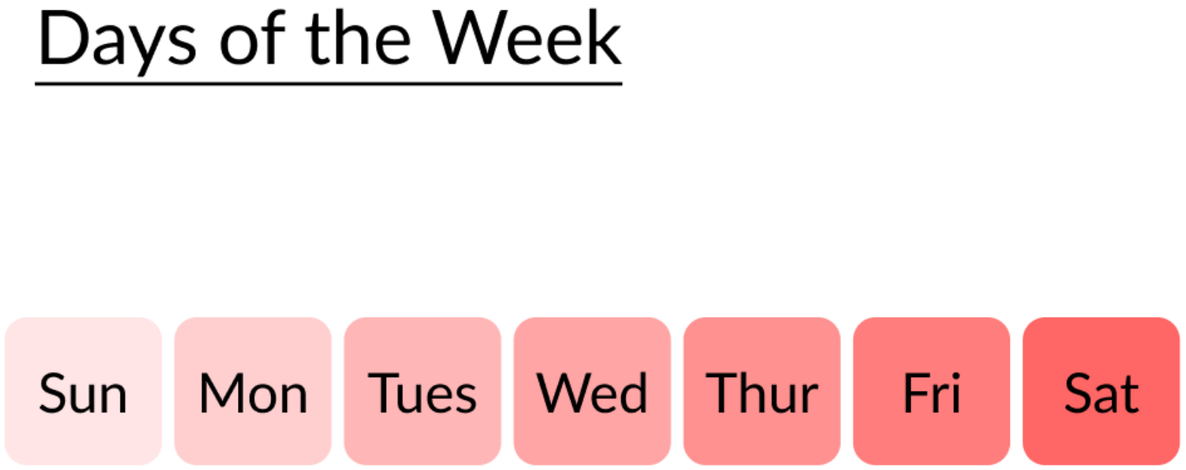
Ordinal data (a)

- Has order between classes
- A set number of distinct classes



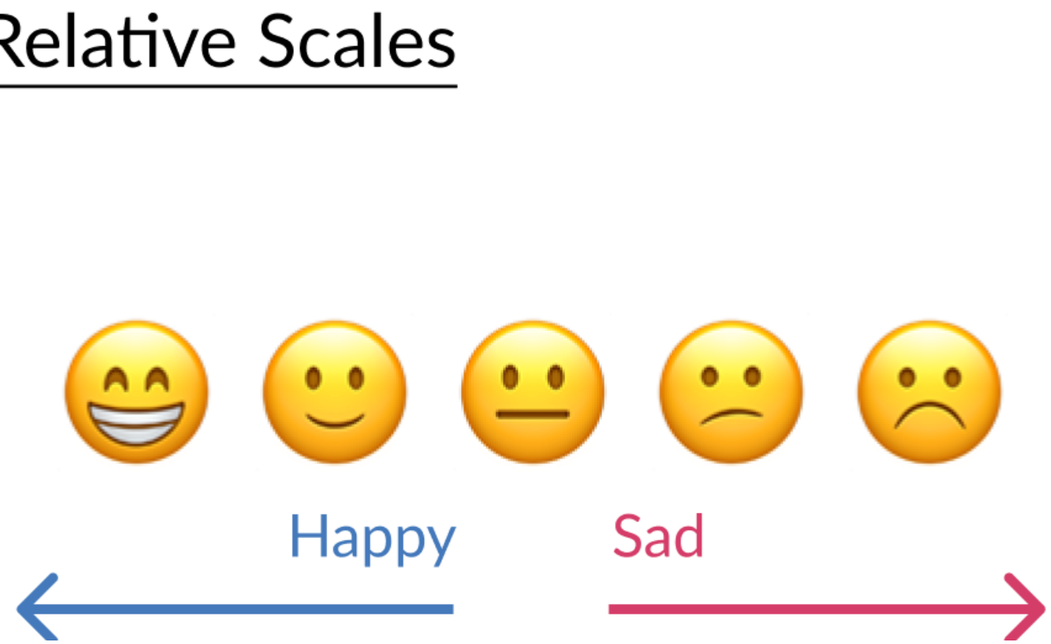
Ordinal data (b)

- Has order between classes
- A set number of distinct classes



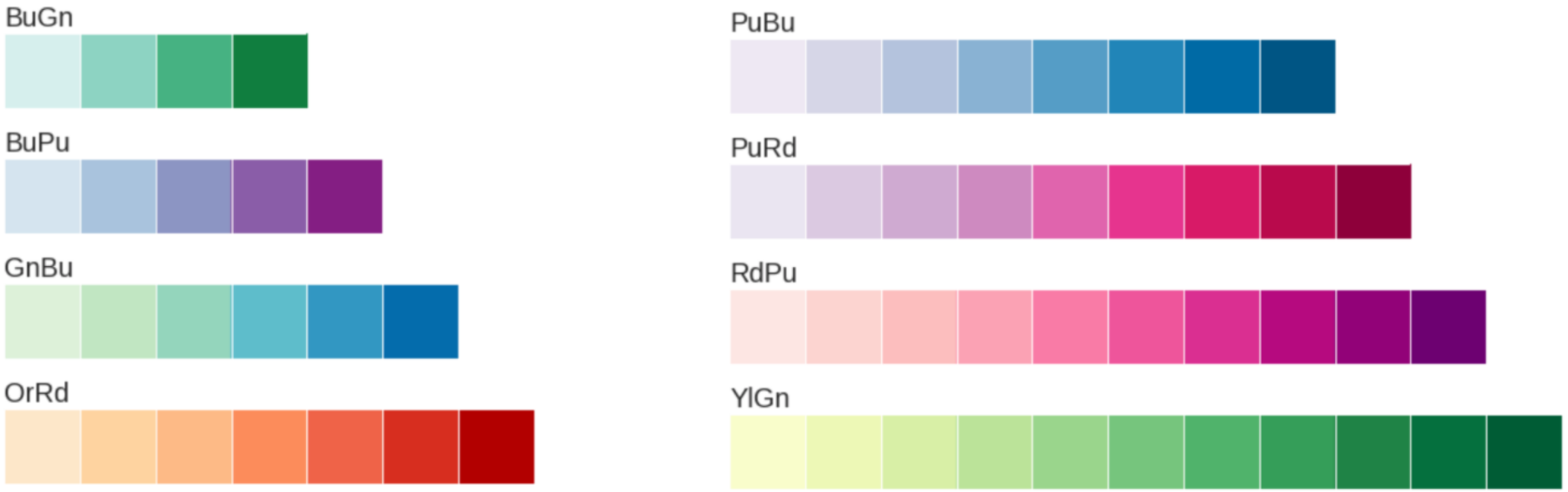
Ordinal data (c)

- Has order between classes
- A set number of distinct classes



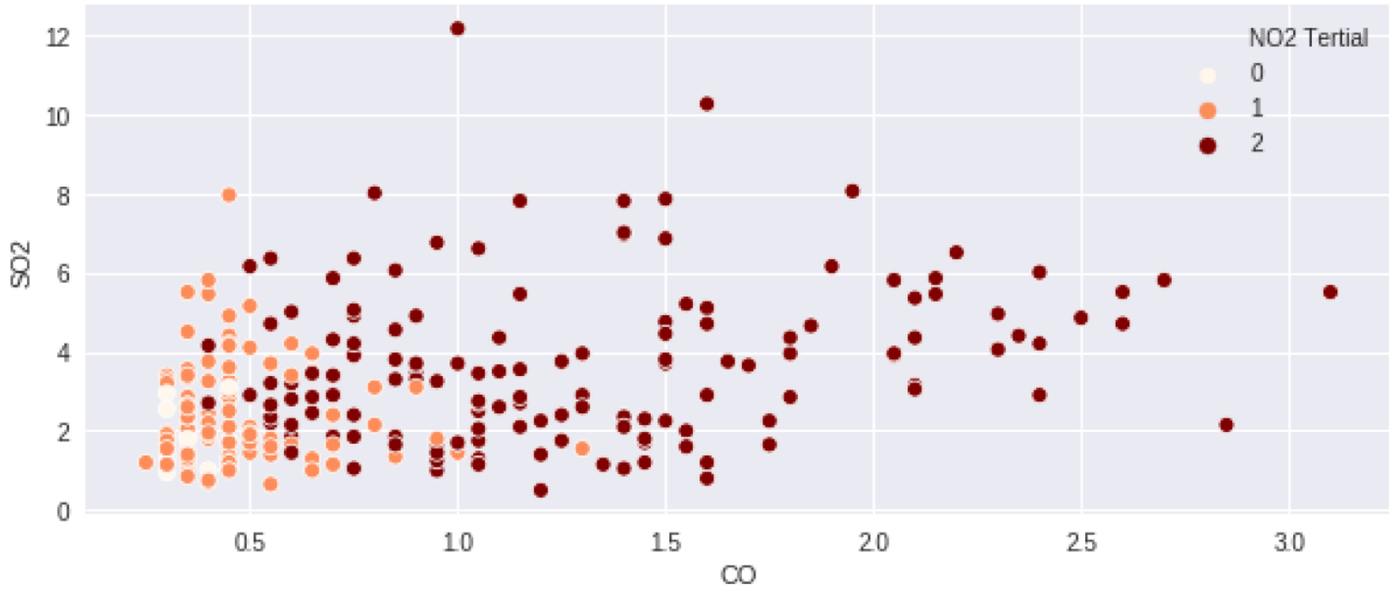
```
colorbrewer_palettes = ['Reds', 'Blues', 'YlOrBr', 'PuBuGn', 'GnBu', 'Greys']

for i, pal in enumerate(colorbrewer_palettes):
    sns.palplot(pal=sns.color_palette(pal, n_colors=i+4))
```



```
# Make a tertials column using qcut()
pollution['NO2 Tertial'] = pd.qcut(pollution['NO2'], 3, labels = False)

# Plot colored by the computer tertials
sns.scatterplot(x="CO", y="SO2", hue='NO2 Tertial', palette="OrRd",
                data=pollution.query("city == 'Long Beach' & year == 2014"))
```



Let's color some categories

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