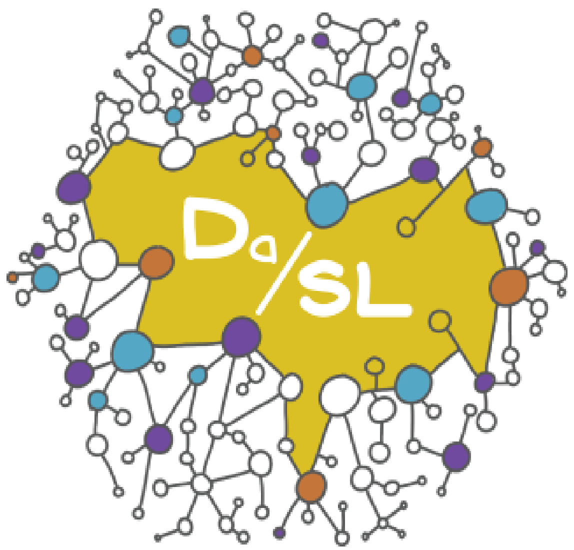
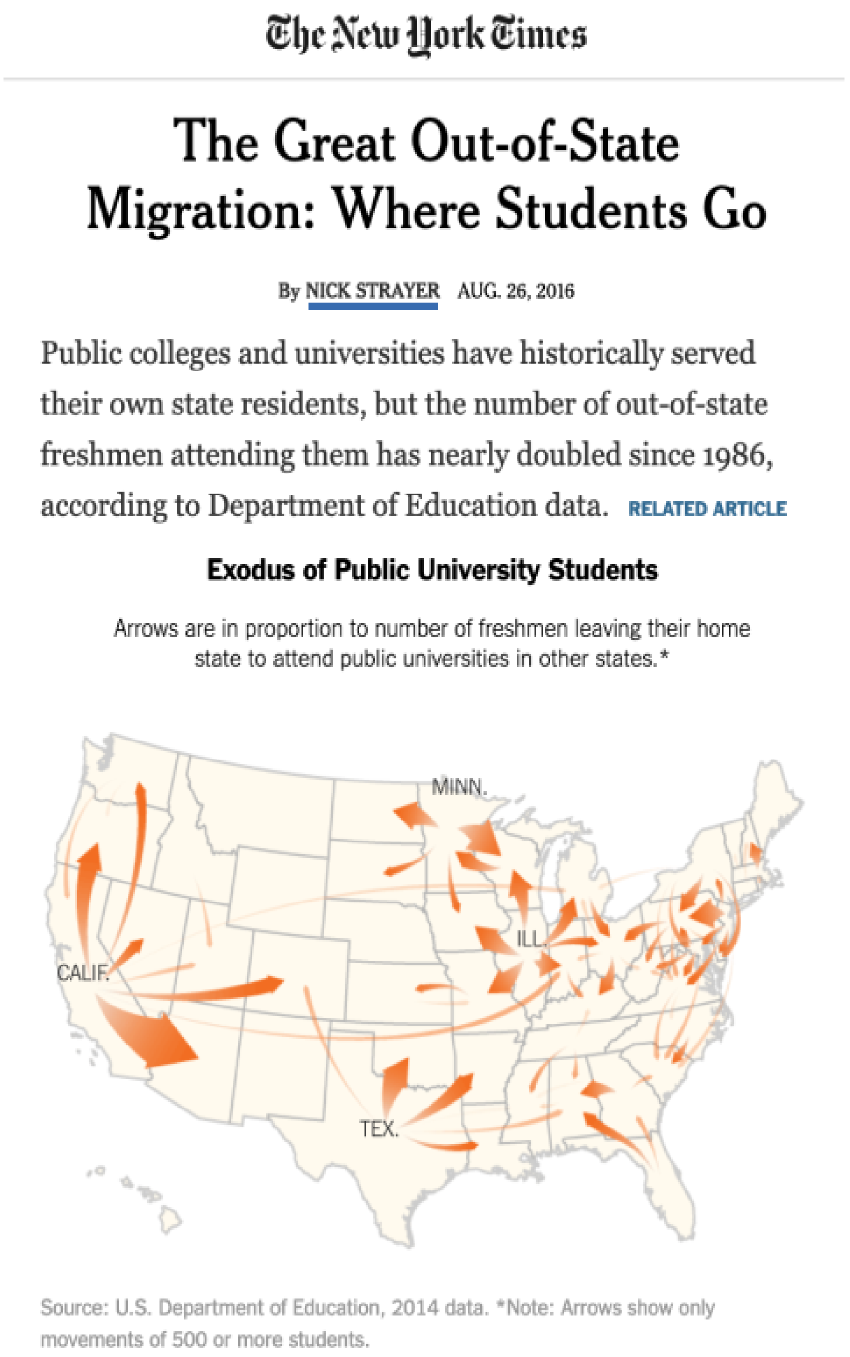
IMPROVING YOUR DATA VISUALIZATIONS IN PYTHON

# Highlighting data

Nick Strayer
Instructor

# About me





The New York Times

The Great Out-of-State Migration: Where Students Go

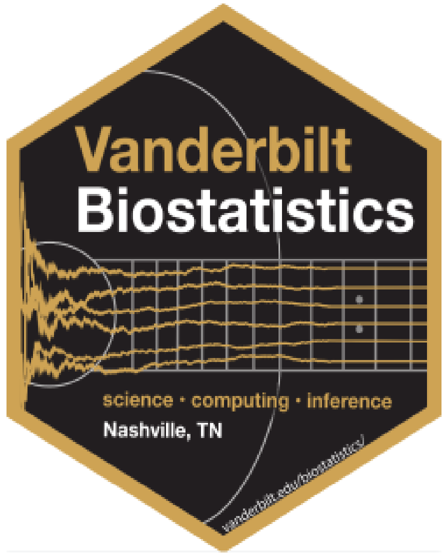
By NICK STRAYER AUG. 26, 2016

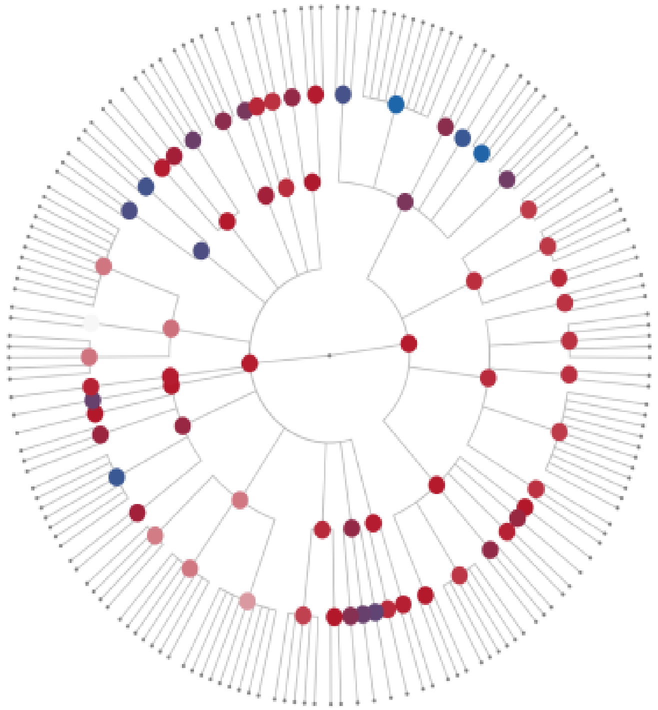
Public colleges and universities have historically served their own state residents, but the number of out-of-state freshmen attending them has nearly doubled since 1986, according to Department of Education data. RELATED ARTICLE

**Exodus of Public University Students**

Arrows are in proportion to number of freshmen leaving their home state to attend public universities in other states.*

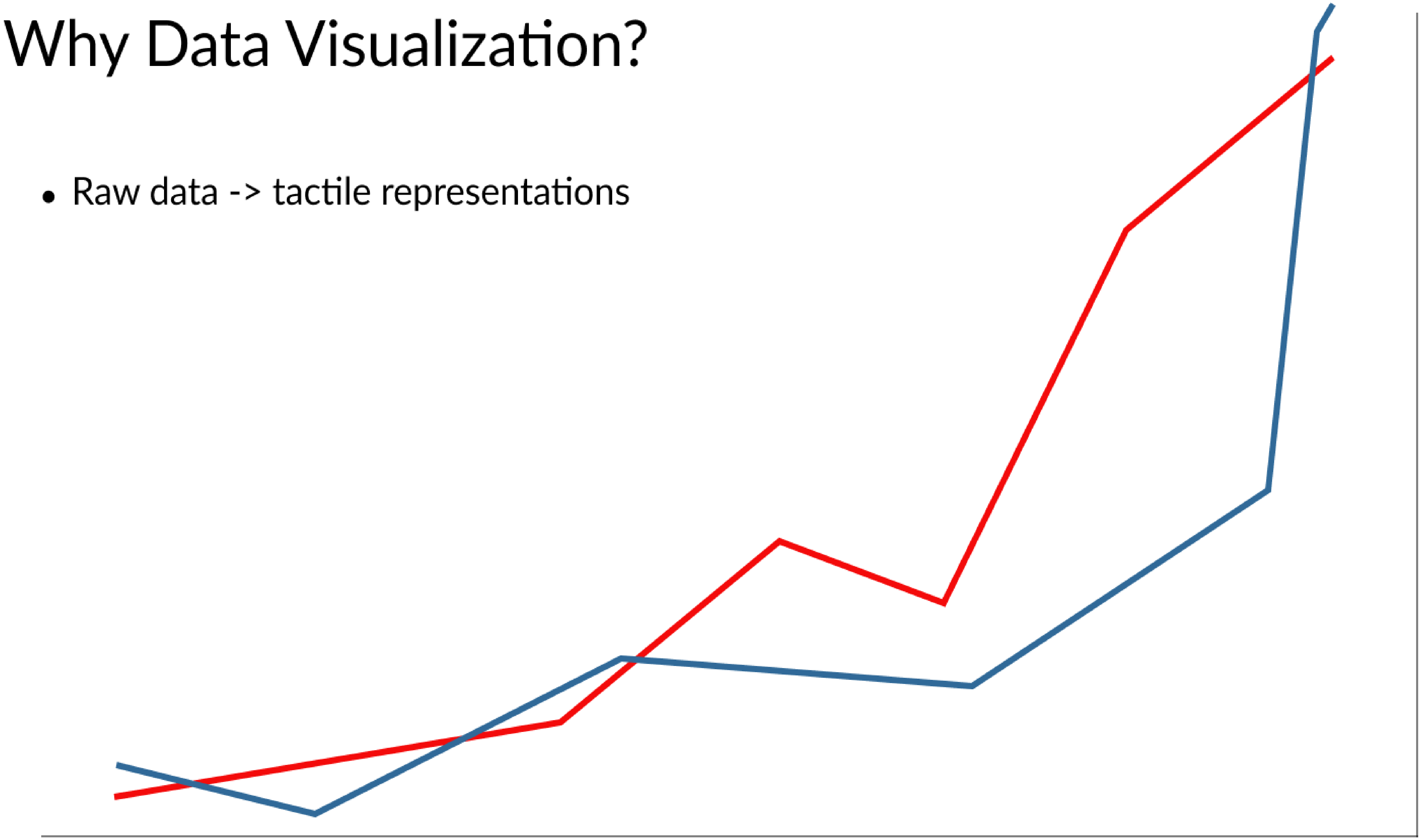
Source: U.S. Department of Education, 2014 data. *Note: Arrows show only movements of 500 or more students.


Vanderbilt
Biostatistics
science • computing • inference
Nashville, TN
vanderbilt.edu/biostatistics/



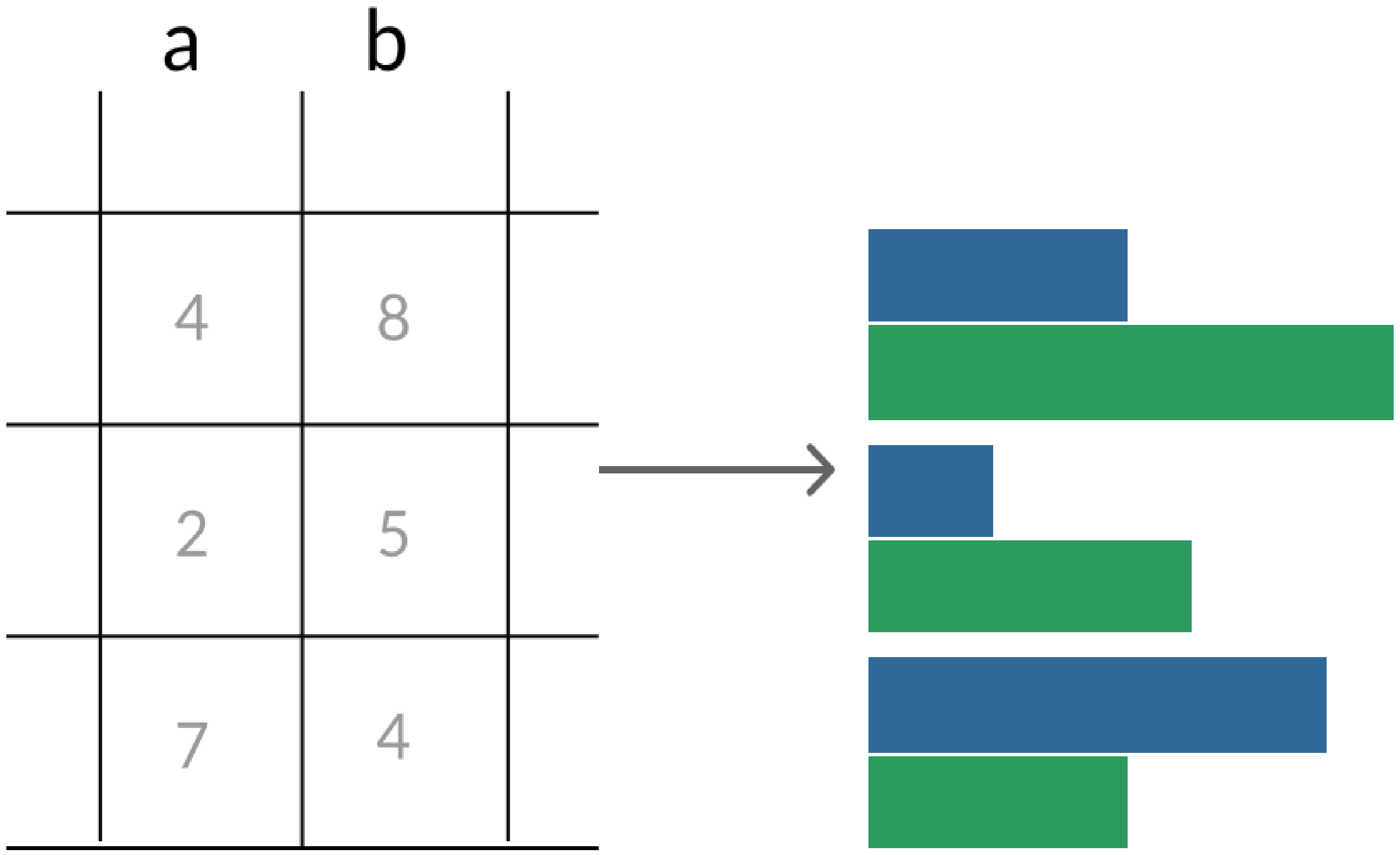
# Why Data Visualization?

- Raw data -> tactile representations



# Why Data Visualization?

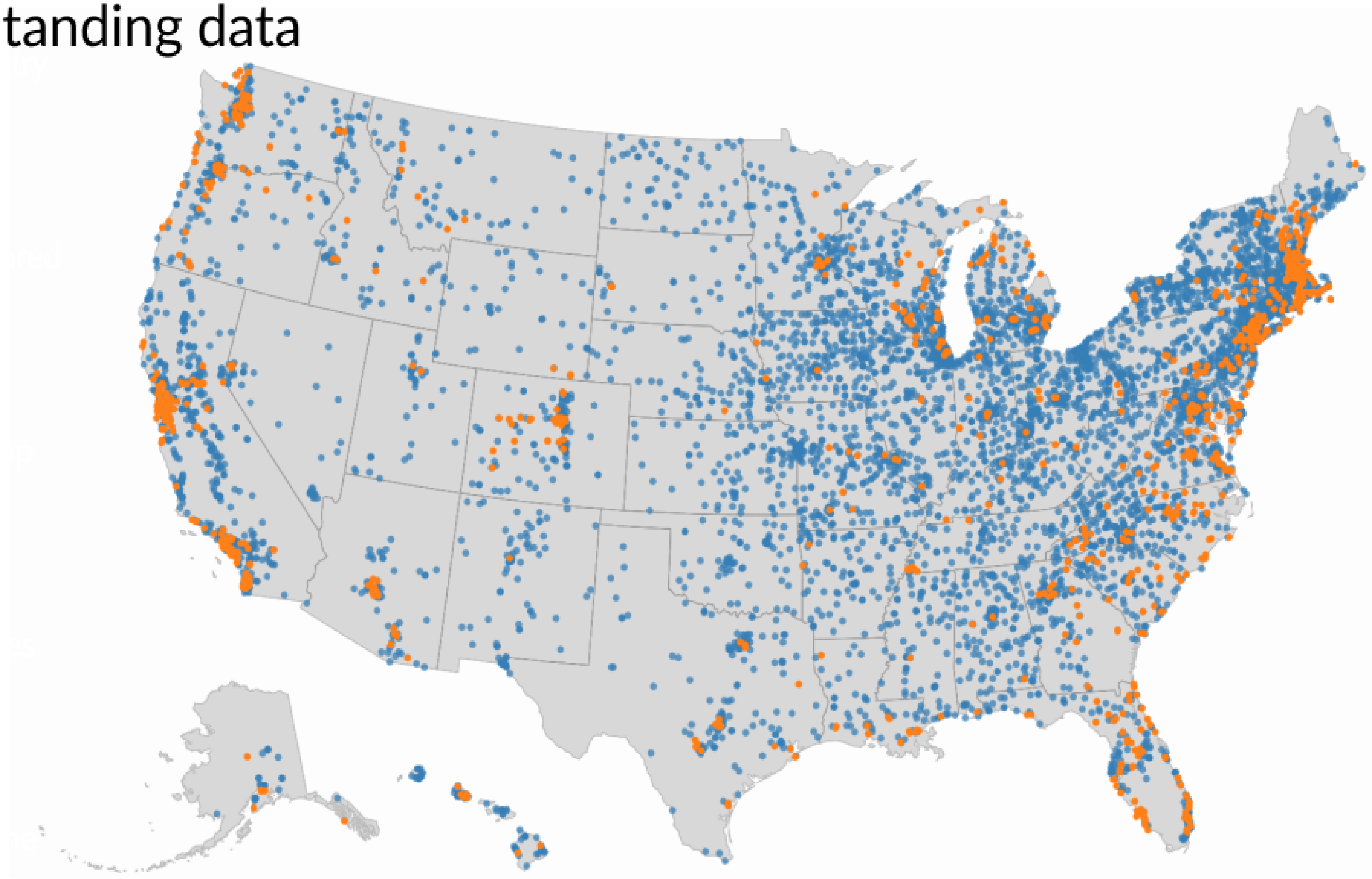
- Raw data -> tactile representations
- *Sometimes* purely cosmetic



| a | b |
|---|---|
| 4 | 8 |
| 2 | 5 |
| 7 | 4 |

# Why Data Visualization?

- Raw data -> tactile representations
- *Sometimes* purely cosmetic
- *Sometimes* essential to understanding data



python

Seaborn

matplotlib

# Prereqs

- List of datacamp prereqs

ggplot2

Google Sheets

tableau

# Course data

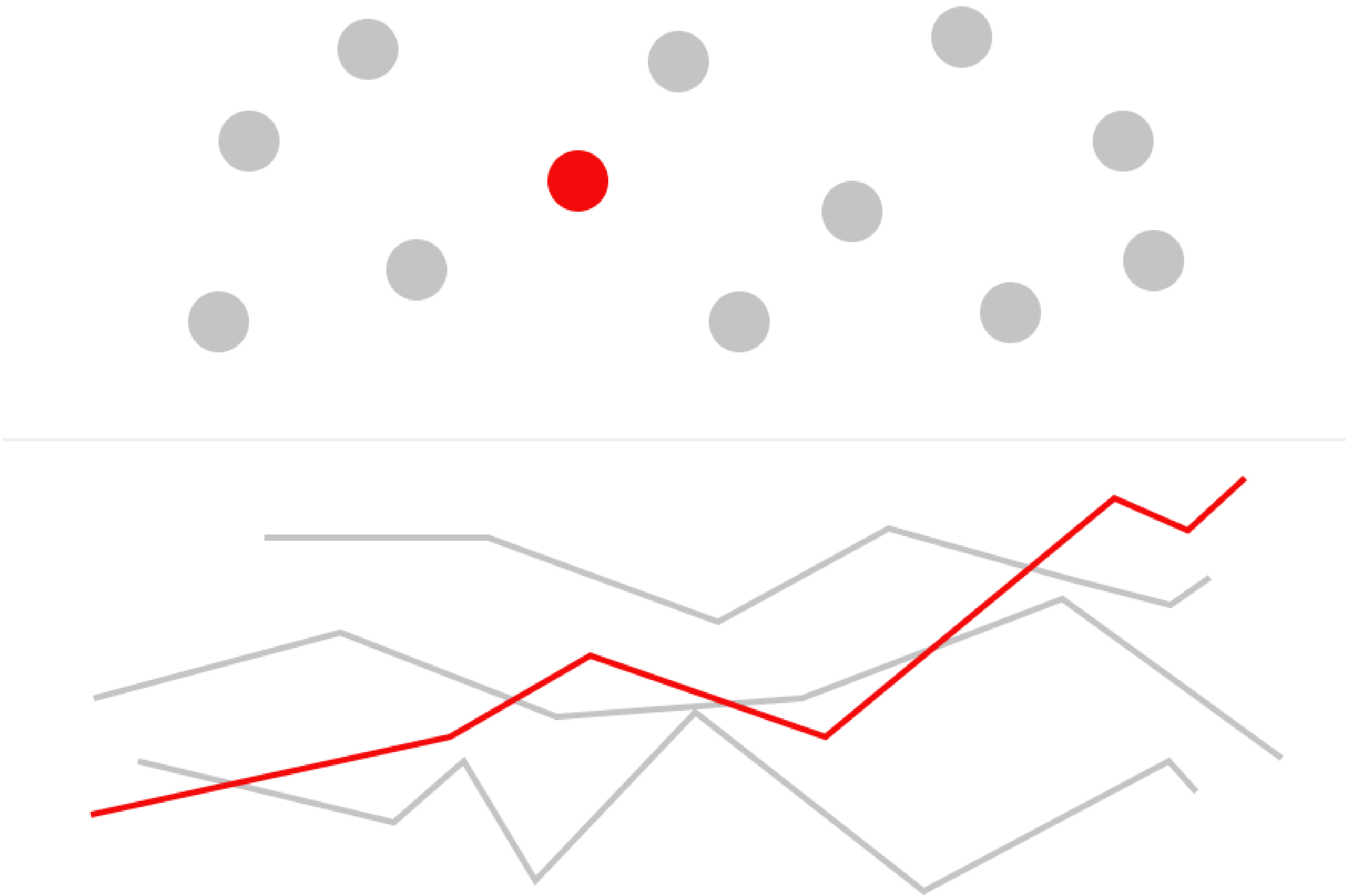
```
pollution.head()

          city  year  month  day     CO   NO2     O3    SO2
0  Cincinnati  2012      1    1  0.245  20.0  0.030   4.20
1  Cincinnati  2012      1    2  0.185   9.0  0.025   6.35
2  Cincinnati  2012      1    3  0.335  31.0  0.025   4.25
3  Cincinnati  2012      1    4  0.305  25.0  0.016  17.15
4  Cincinnati  2012      1    5  0.345  21.0  0.016  11.05
```

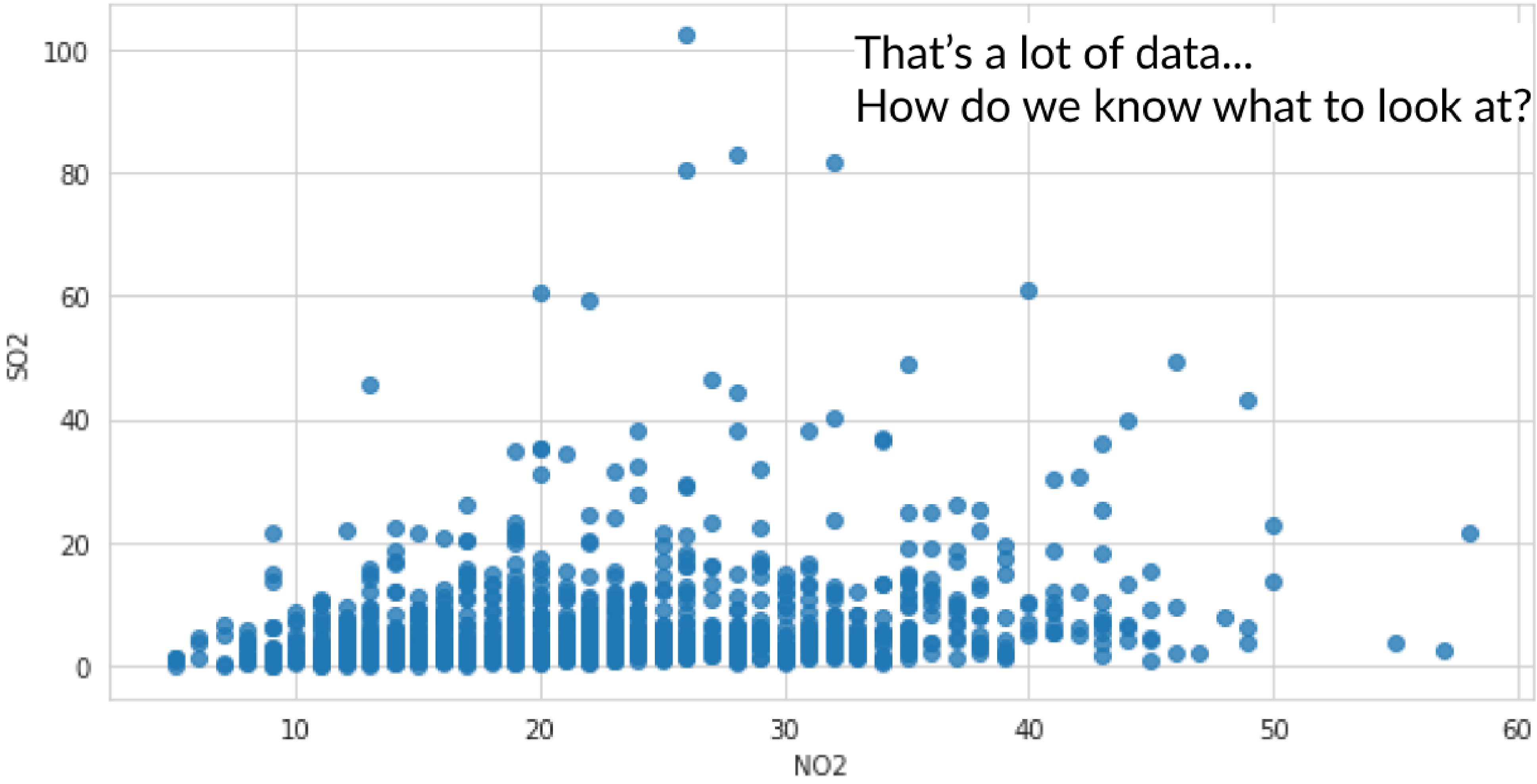
```
pollution.city.unique()

[ 'Boston',    'Cincinnati',     'Denver',        'Des Moines',
  'Fairbanks', 'Houston',        'Indianapolis', 'Long Beach',
  'New York',  'Salt Lake City', 'Vandenberg Air Force Base' ]
```

# Highlighting data



# Why highlight?



That's a lot of data...
How do we know what to look at?

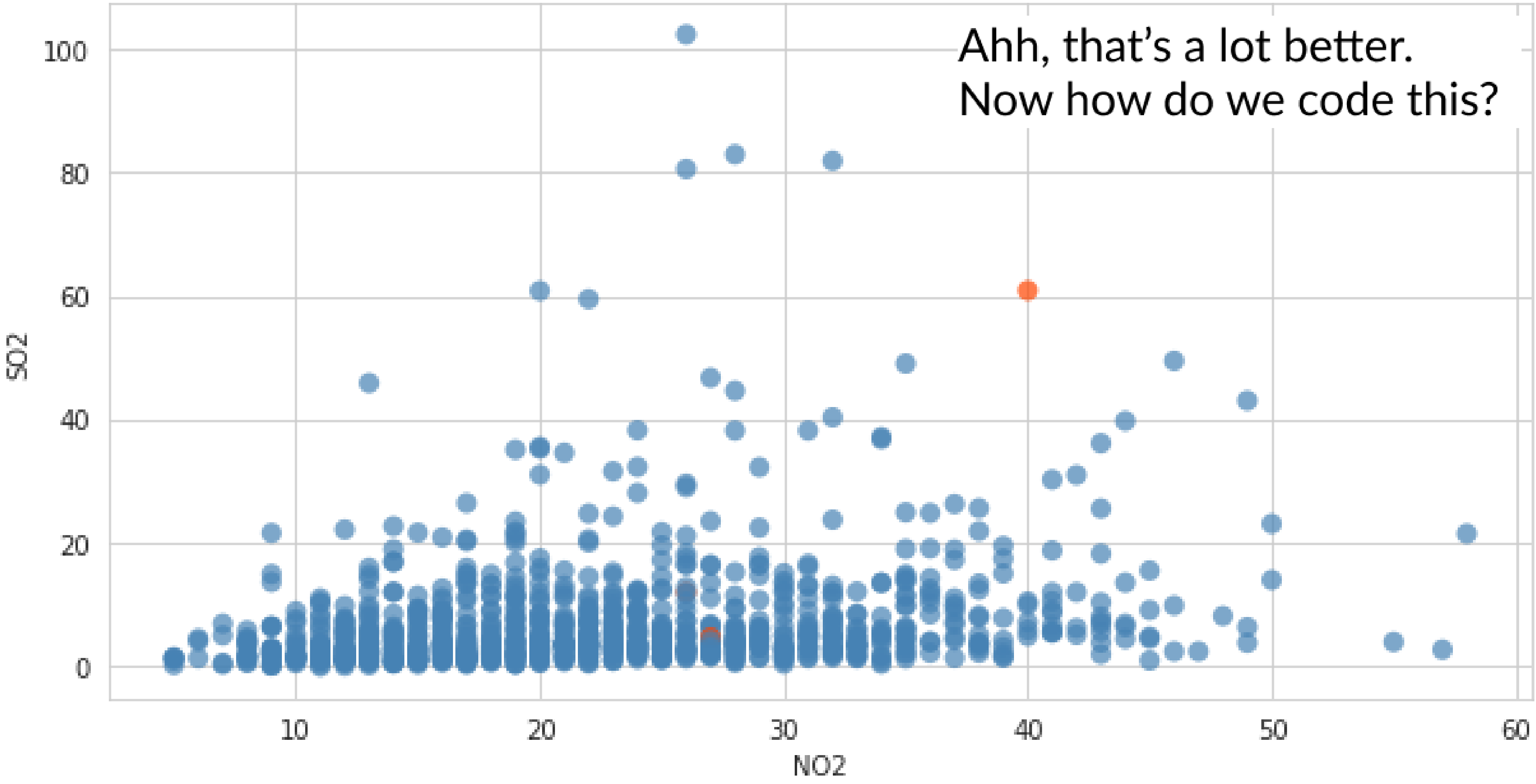
# How to highlight (code)

```python
cinci_pollution = pollution[pollution.city == 'Cincinnati']

# Make an array of colors based upon if a row is a given day
cinci_colors = ['orangered' if day == 38 else 'steelblue'
                for day in cinci_pollution.day]

# Plot with additional scatter plot argument facecolors
p = sns.regplot(x='NO2',
                y='SO2',
                data = cinci_pollution,
                fit_reg=False,
                scatter_kws={'facecolors': cinci_colors,'alpha': 0.7})
```

# How to highlight



Ahh, that's a lot better.
Now how do we code this?

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# Let's make some highlights!

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# Comparing groups

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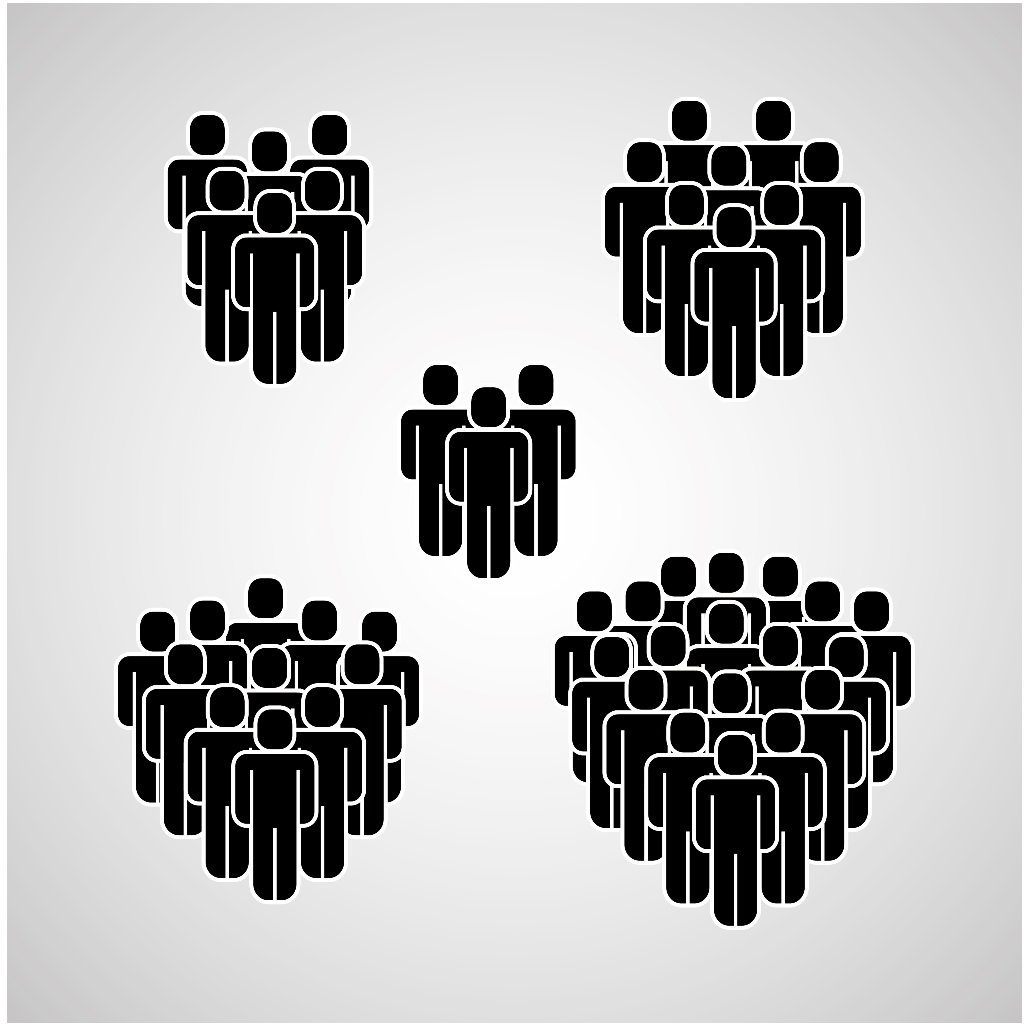
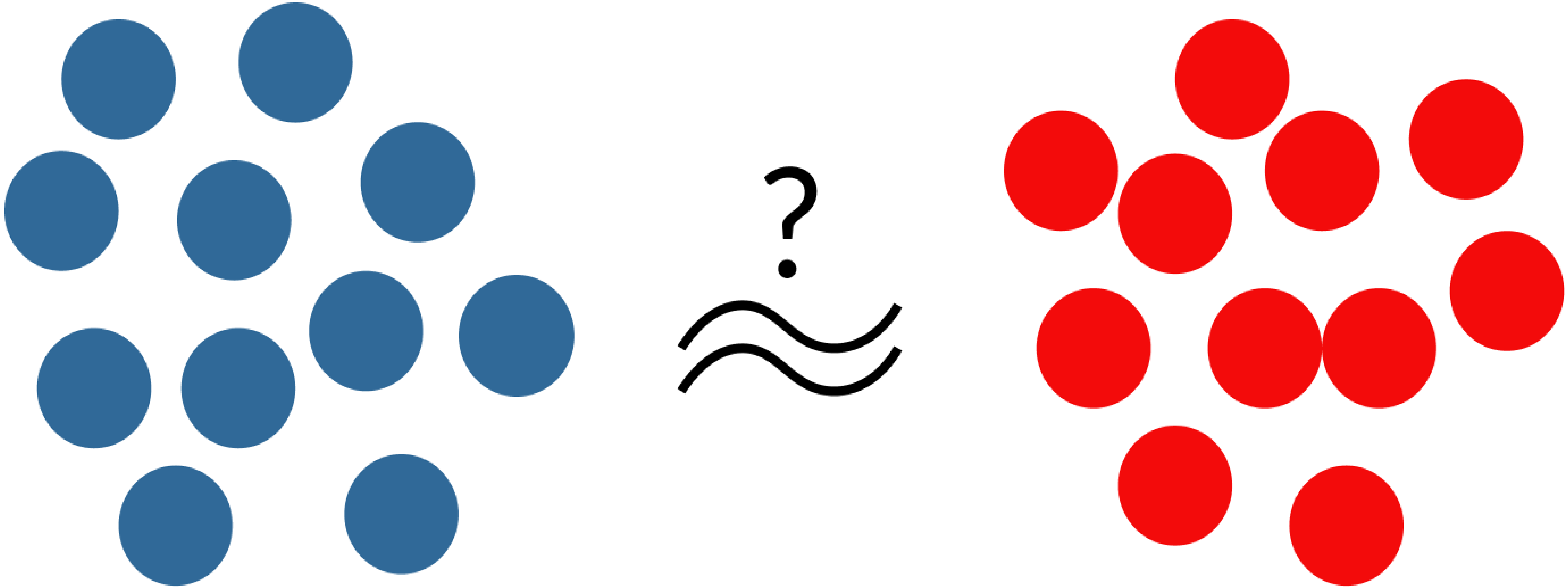
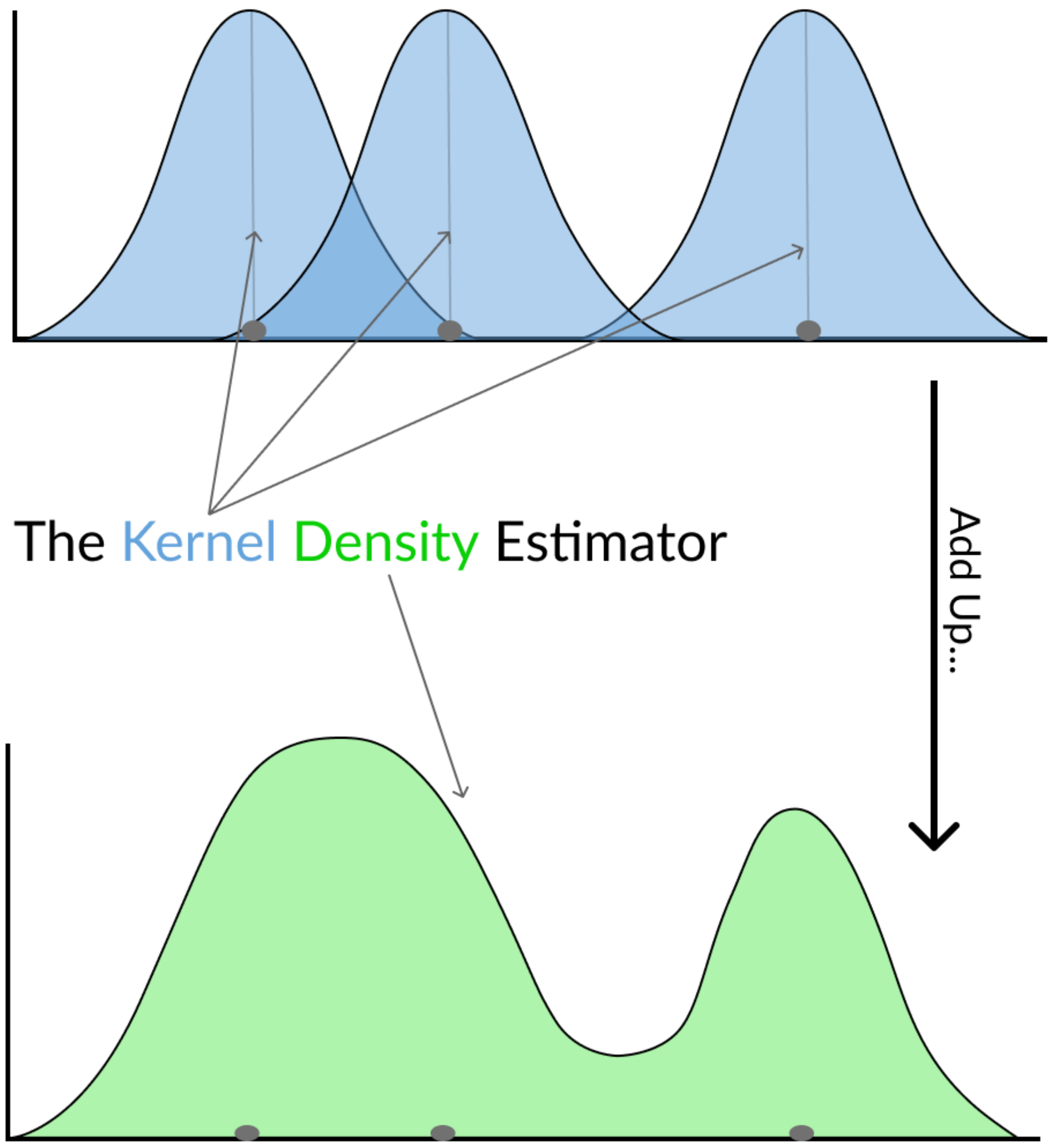
# What does this mean?

- Values generally higher?
- Distribution of values wider? Narrower?
- Crucial for representing your data



# Comparing a couple classes

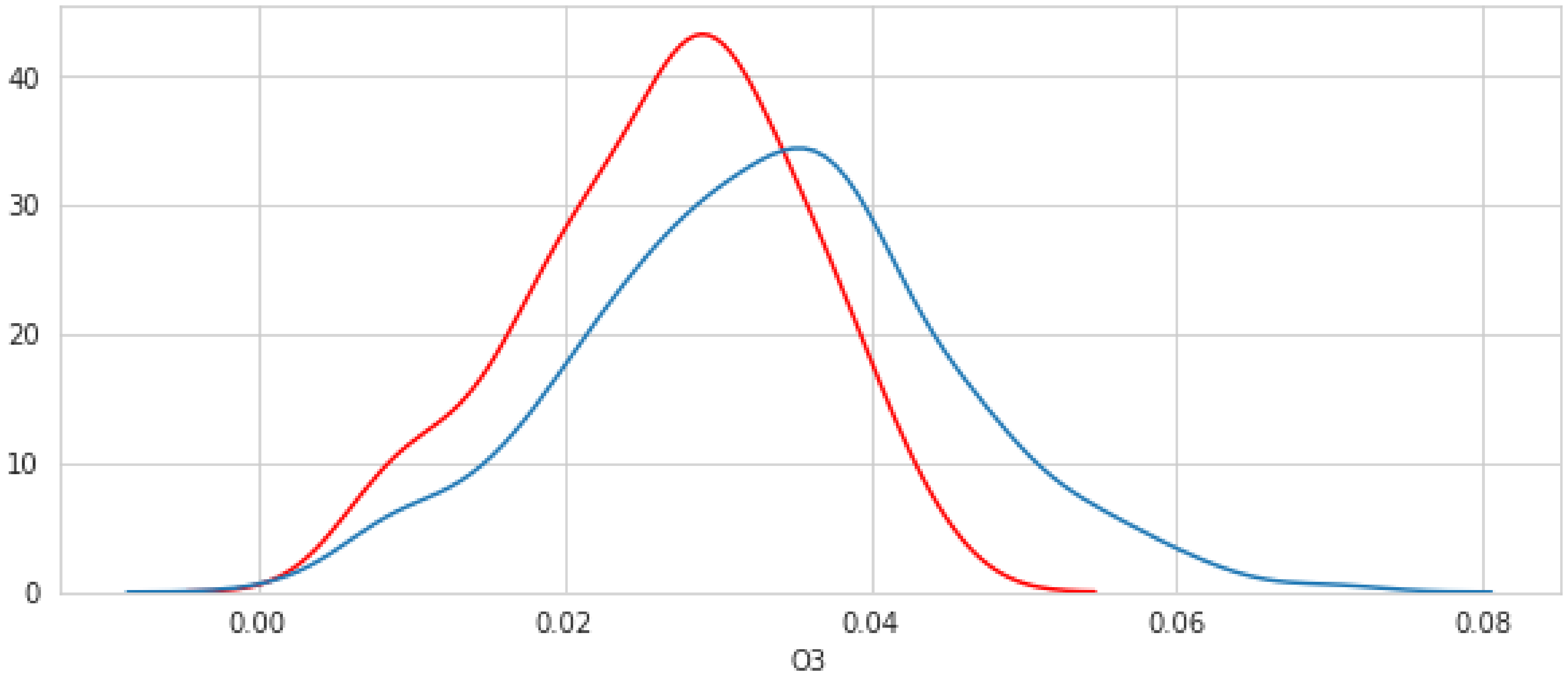



The Kernel Density Estimator
Add Up...

# Kernel density example

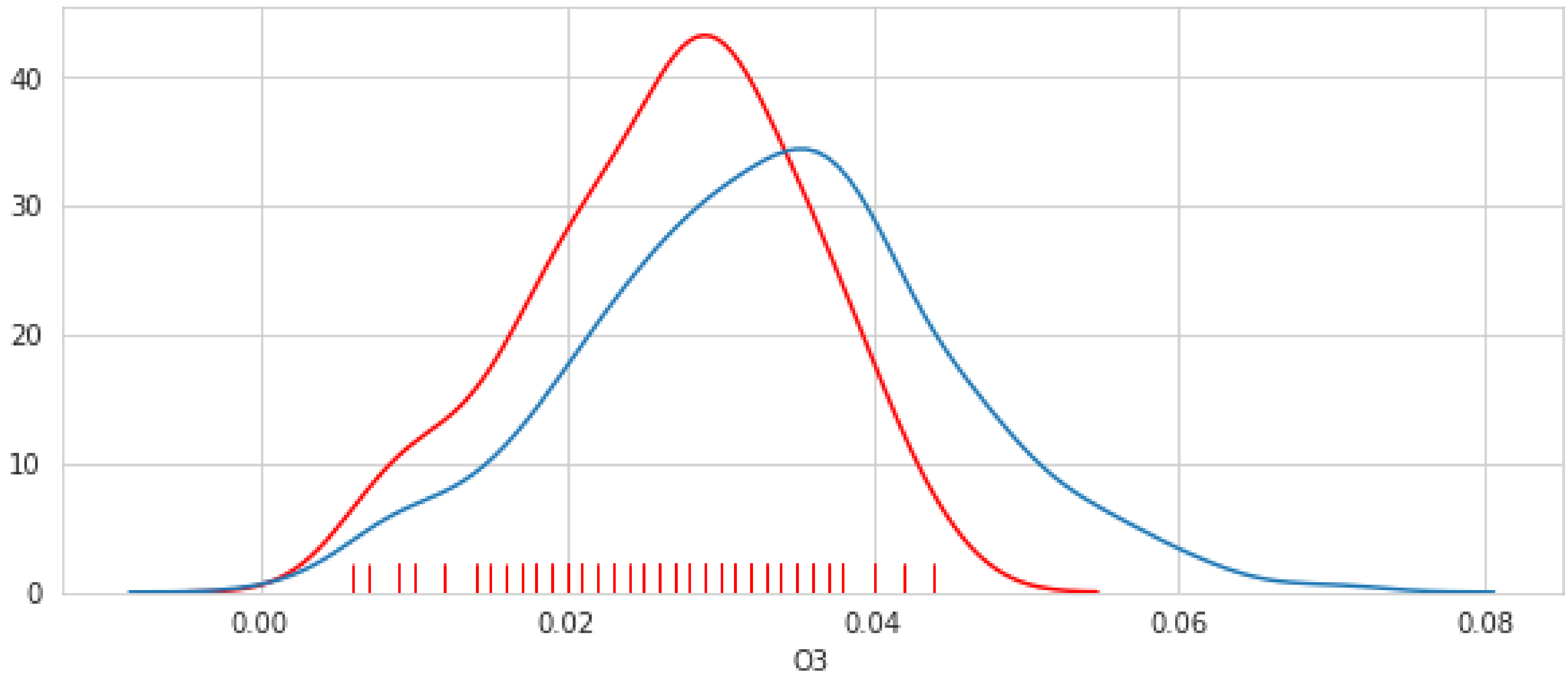
```
pollution_nov = pollution[pollution.month == 10]

sns.distplot(pollution_nov[pollution_nov.city == 'Denver'].O3, hist=False,
             color = 'red')
sns.distplot(pollution_nov[pollution_nov.city != 'Denver'].O3, hist=False)
```

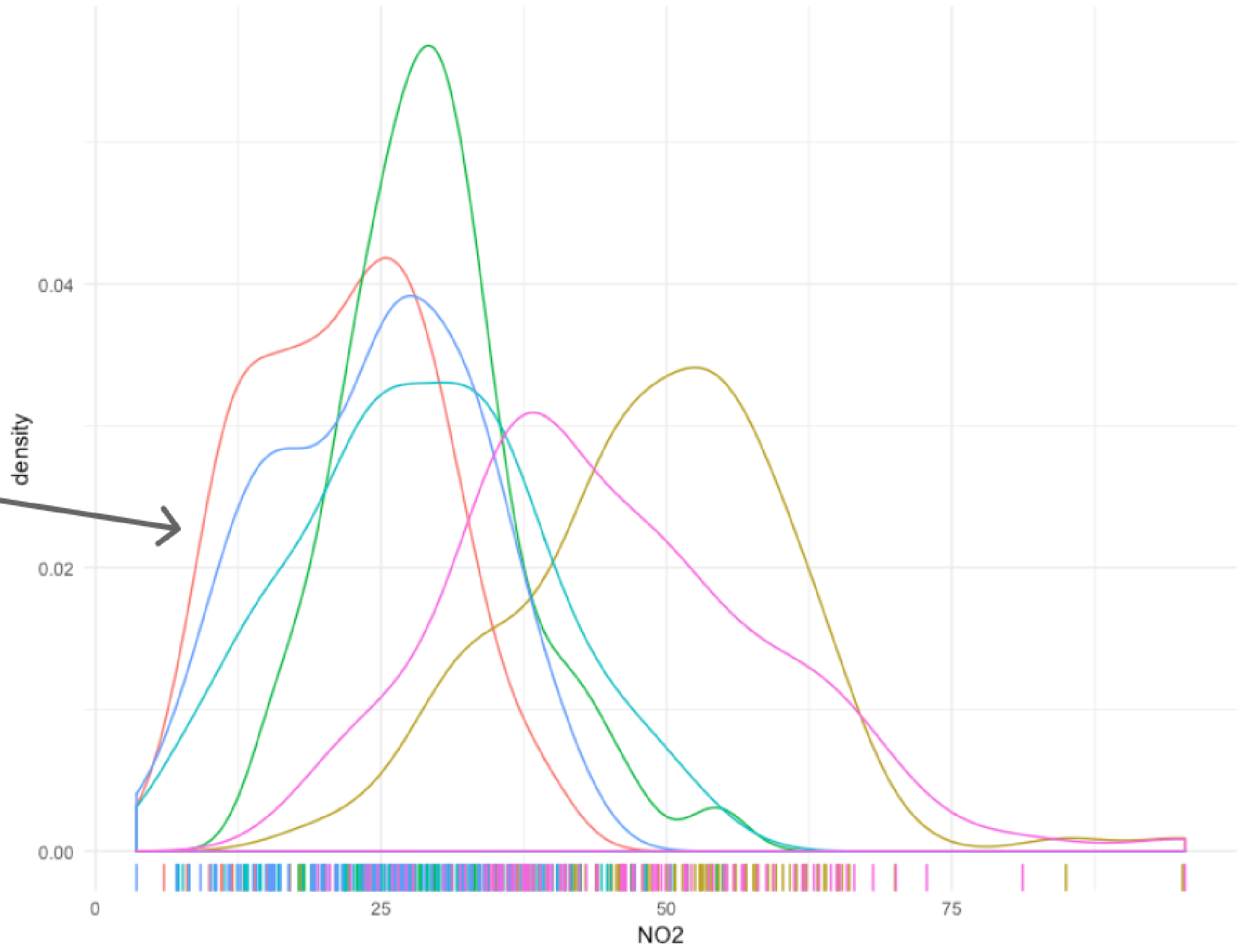


# Kernel density tweak

```
# Enable rugplot
sns.distplot(pollution_nov[pollution_nov.city == 'Denver'].O3,
             hist=False, color='red', rug=True )
sns.distplot(pollution_nov[pollution_nov.city != 'Denver'].O3, hist=False)
```

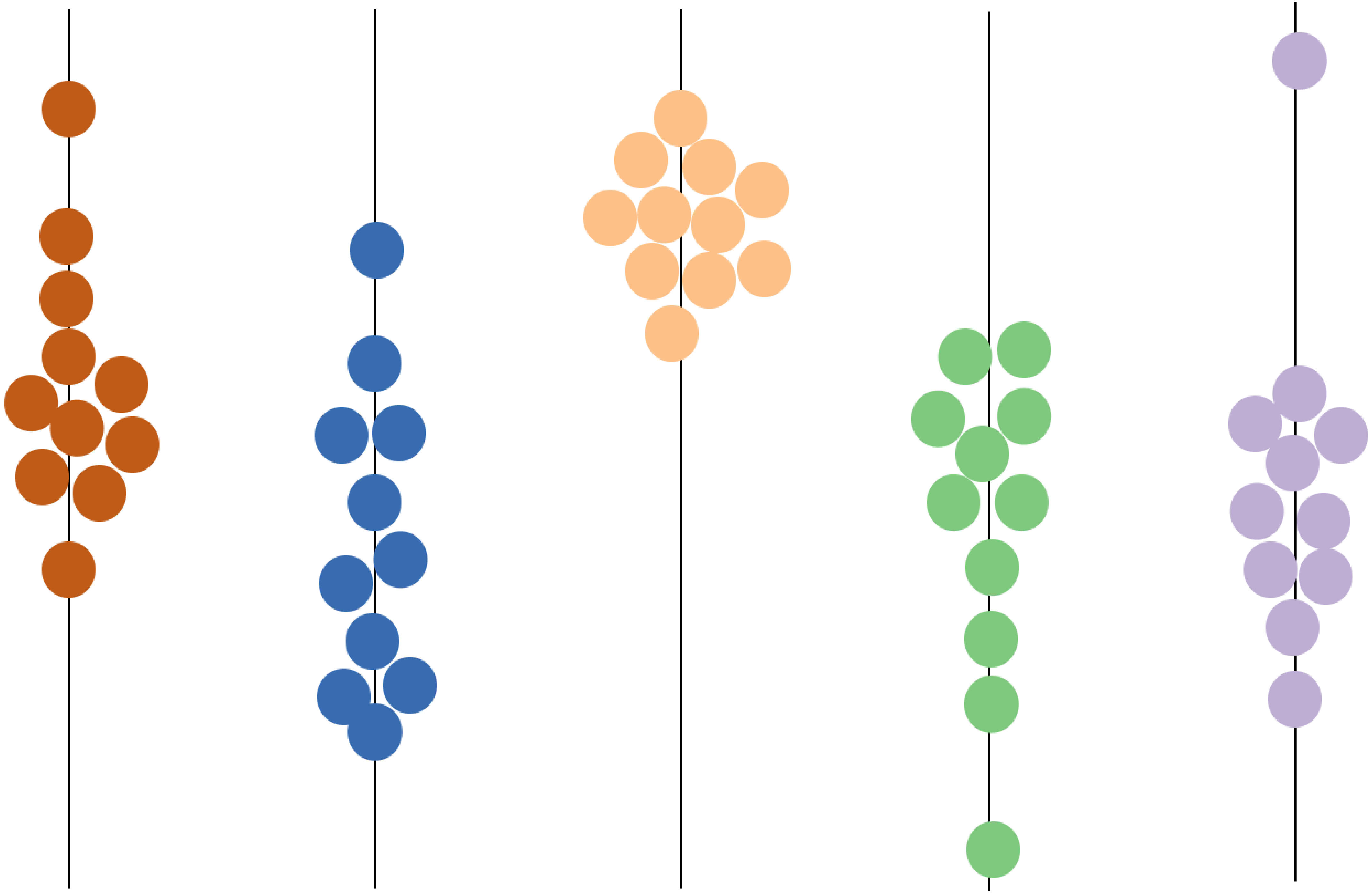


# Comparing many classes



Hard to keep to keep track of lines

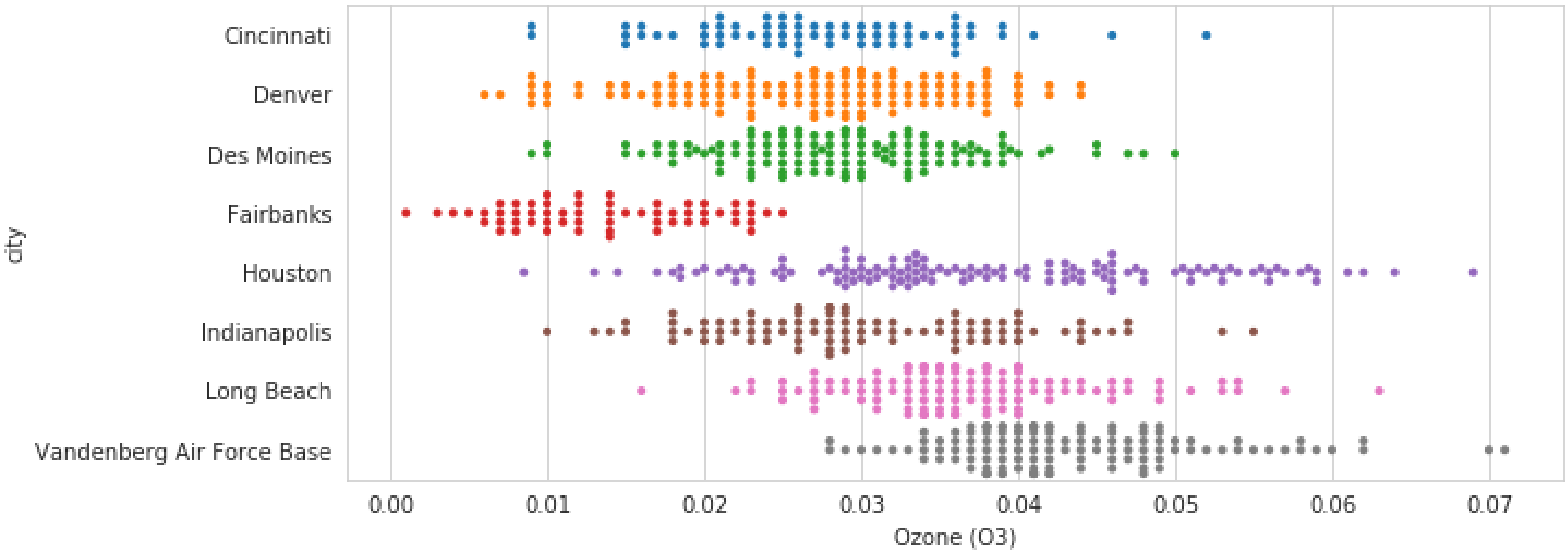
# The beeswarm plot



# Beeswarm example

```
pollution_nov = pollution[pollution.month == 10]

sns.swarmplot(y="city", x="O3", data=pollution_nov, size=4)
plt.xlabel("Ozone (O3)")
```



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# Let's compare!

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# Annotations

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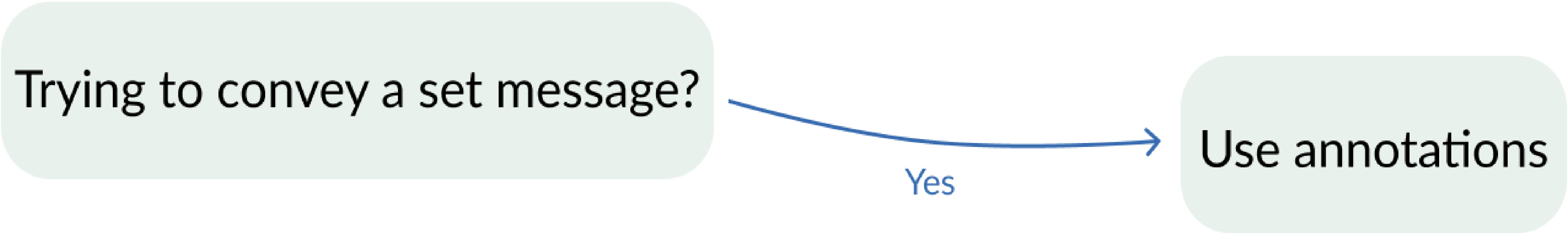
# What annotations add

- Compact and efficient communication
- Opportunity to supply deeper insight to data

# When to use annotations

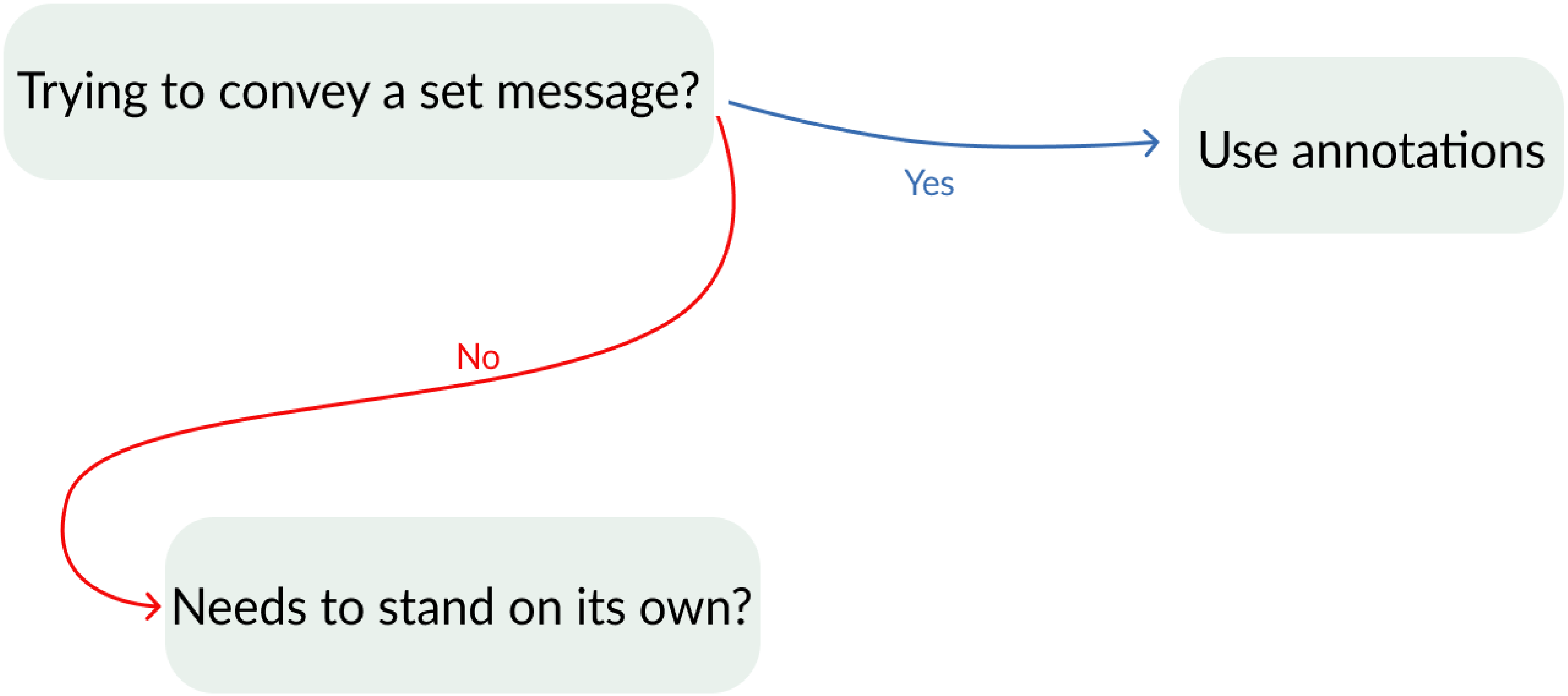


Trying to convey a set message?

Yes

Use annotations

# When to use annotations



Trying to convey a set message?

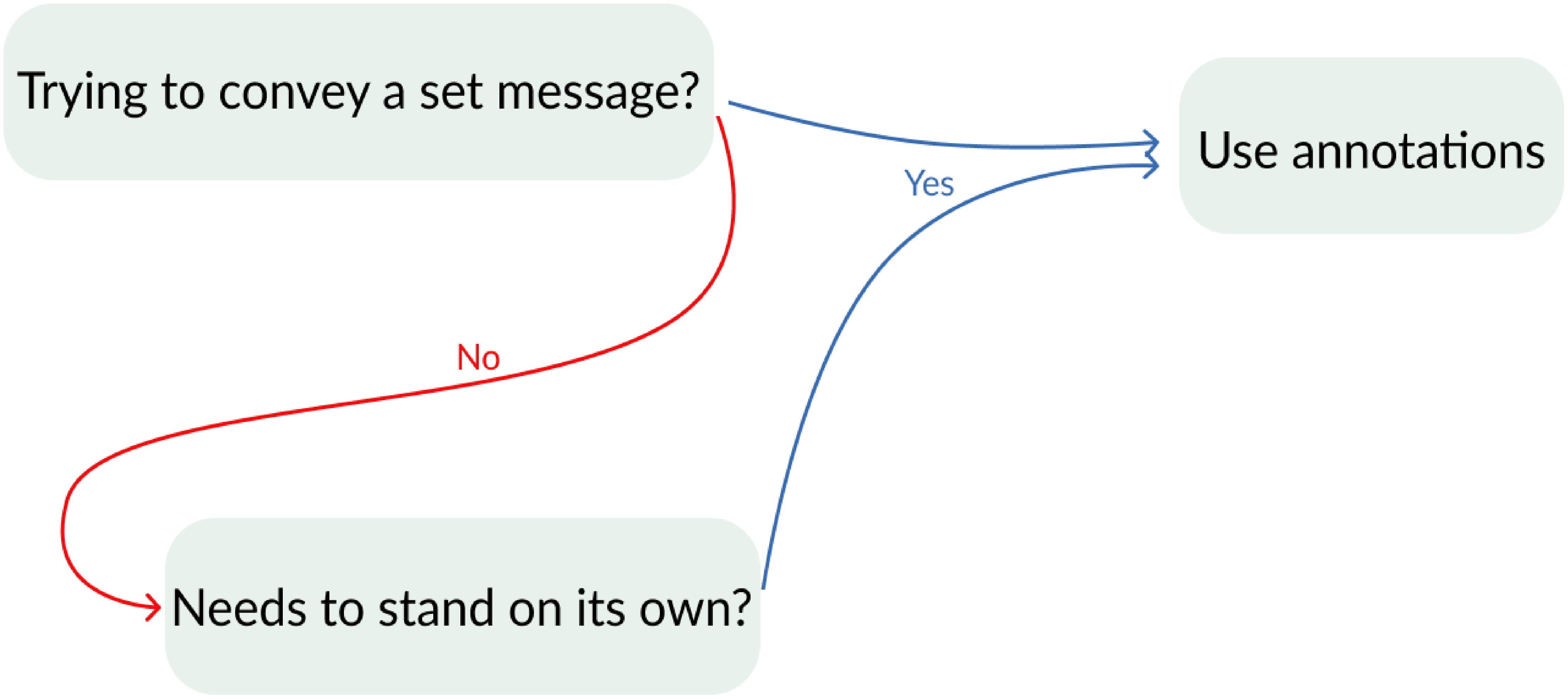
Yes

Use annotations

No

Needs to stand on its own?

# When to use annotations



Trying to convey a set message?

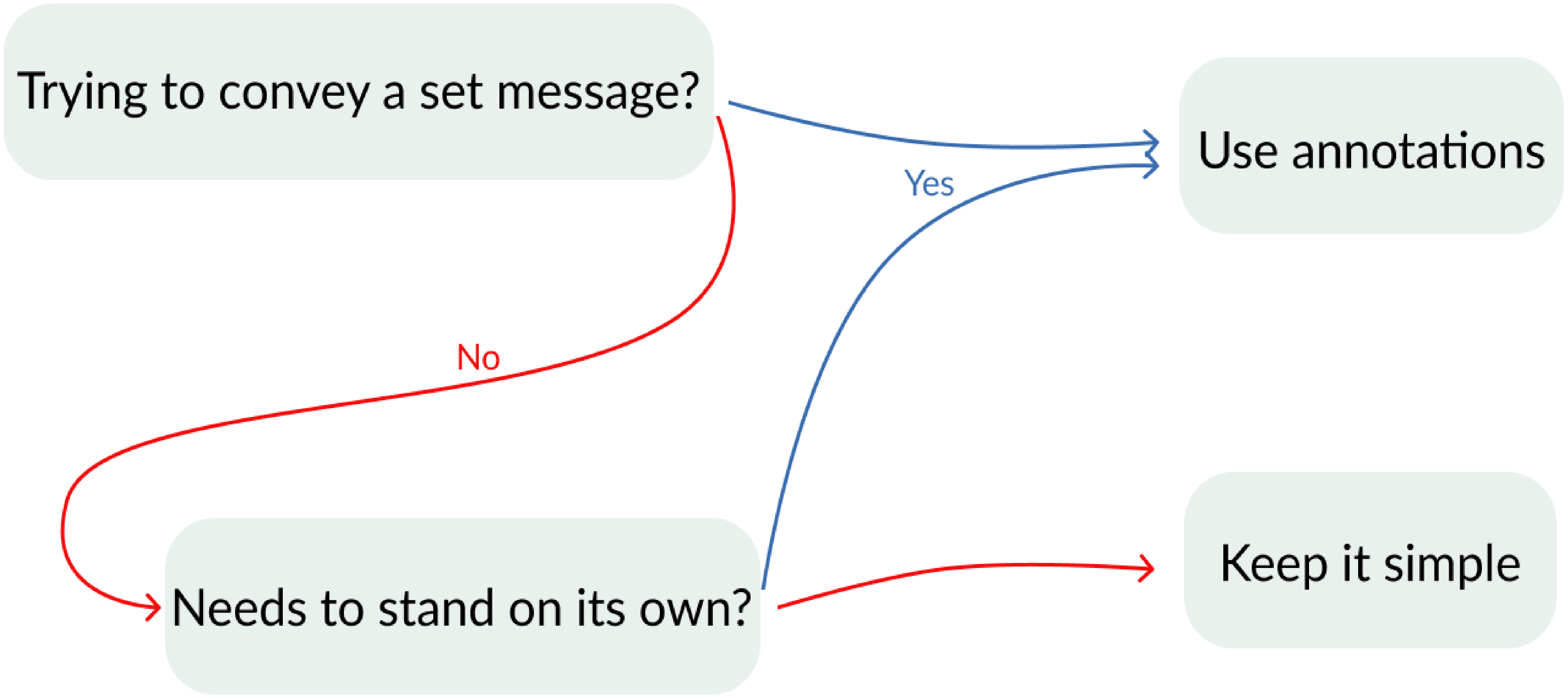
No

Yes

Needs to stand on its own?

Use annotations

# When to use annotations



Trying to convey a set message?

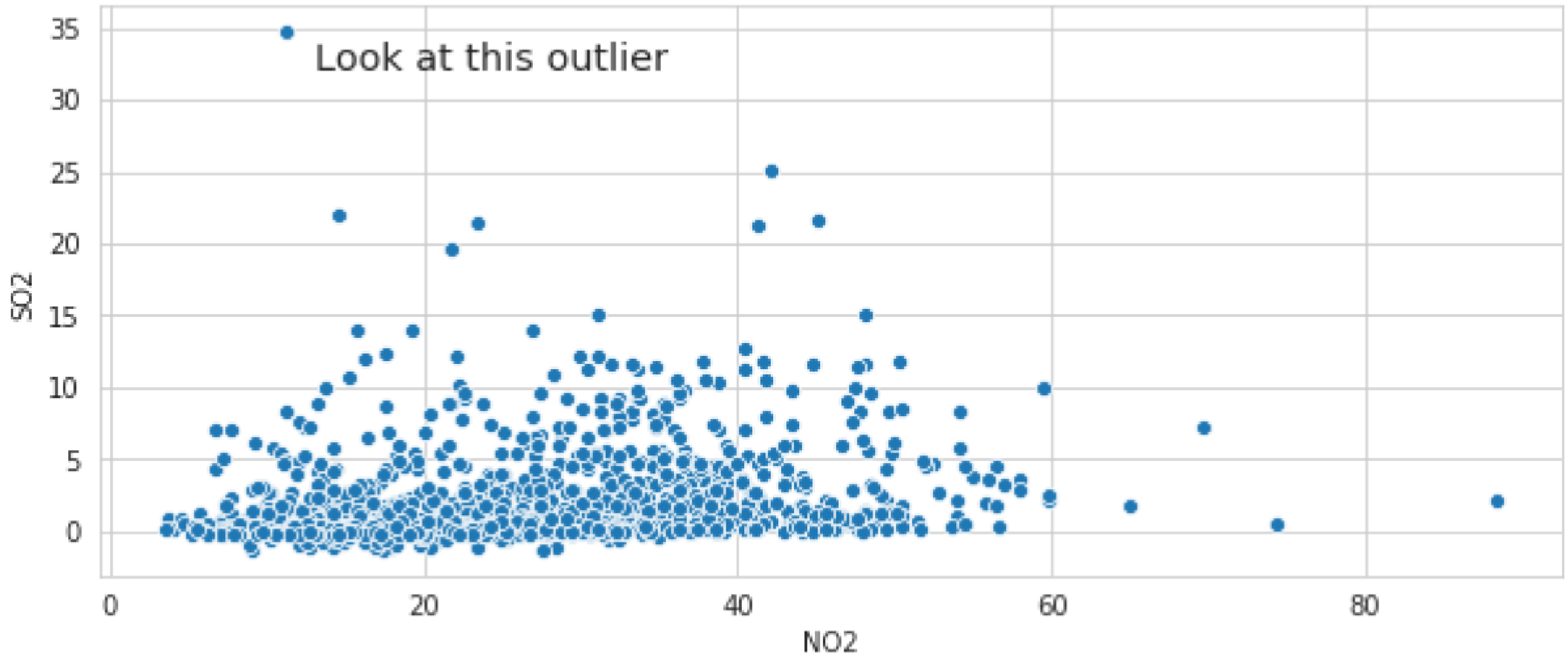
Use annotations

Needs to stand on its own?

Keep it simple

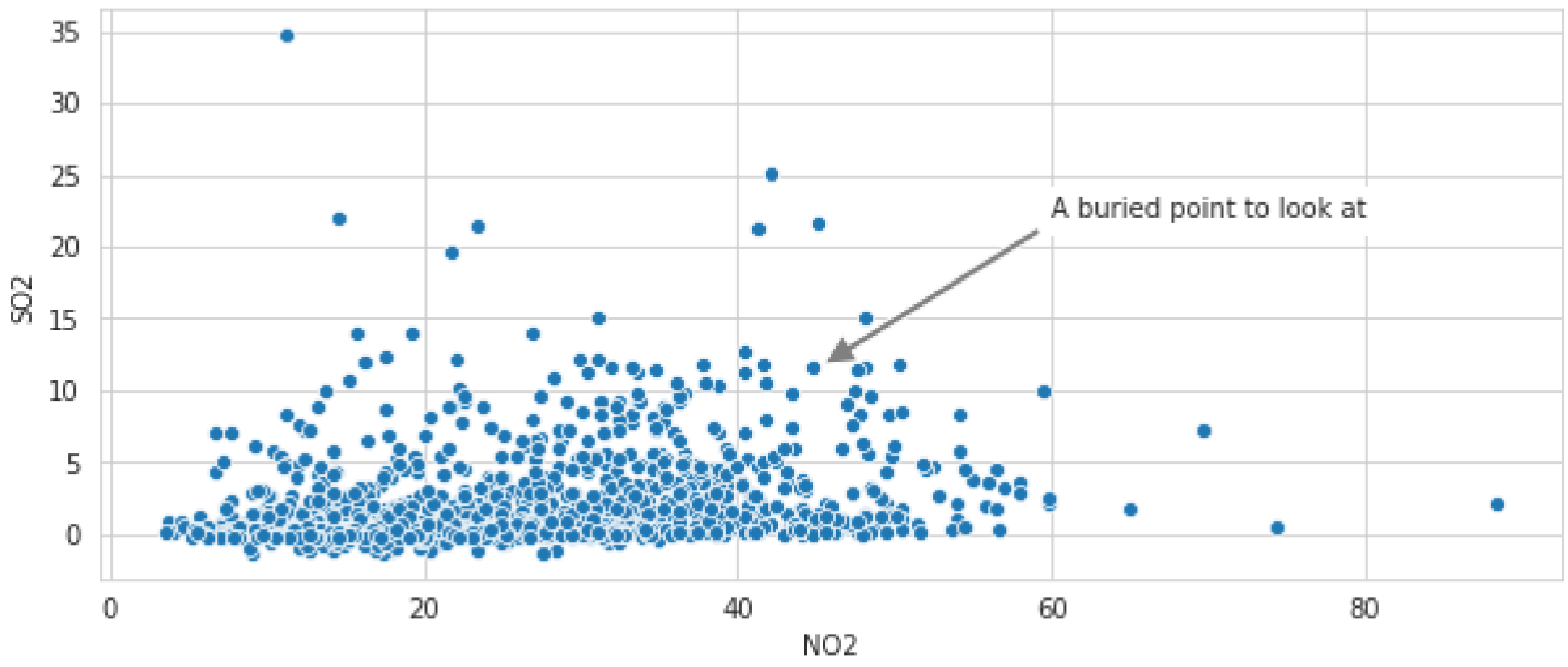
# Adding basic text annotations

```
sns.scatterplot(x='NO2', y='SO2', data = houston_pollution)

# X and Y location of outlier and text
plt.text(13,33,'Look at this outlier',
         # Text properties for alignment and size.
         fontdict = {'ha': 'left', 'size': 'x-large'})
```



# Annotations with arrows

```
sns.scatterplot(x='NO2', y='SO2', data = houston_pollution)

# Arrow start and annotation location
plt.annotate('A buried point to look at', xy=(45.5,11.8), xytext=(60,22),
  # Arrow configuration and background box
  arrowprops={'facecolor':'grey', 'width': 3}, backgroundcolor = 'white' )
```



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# Let's annotate