

# Custom buttons

INTRODUCTION TO DATA VISUALIZATION WITH PLOTLY IN PYTHON



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# What can custom buttons do?

Custom buttons can:

- Update the data or layout elements of a plot
  - All of our `update_layout()` customizations could be in a button!
- Assist with animations (beyond the scope of this course)

# Custom buttons in Plotly

Buttons are added via an `updatemenus` argument (a list of dictionaries) with important arguments:

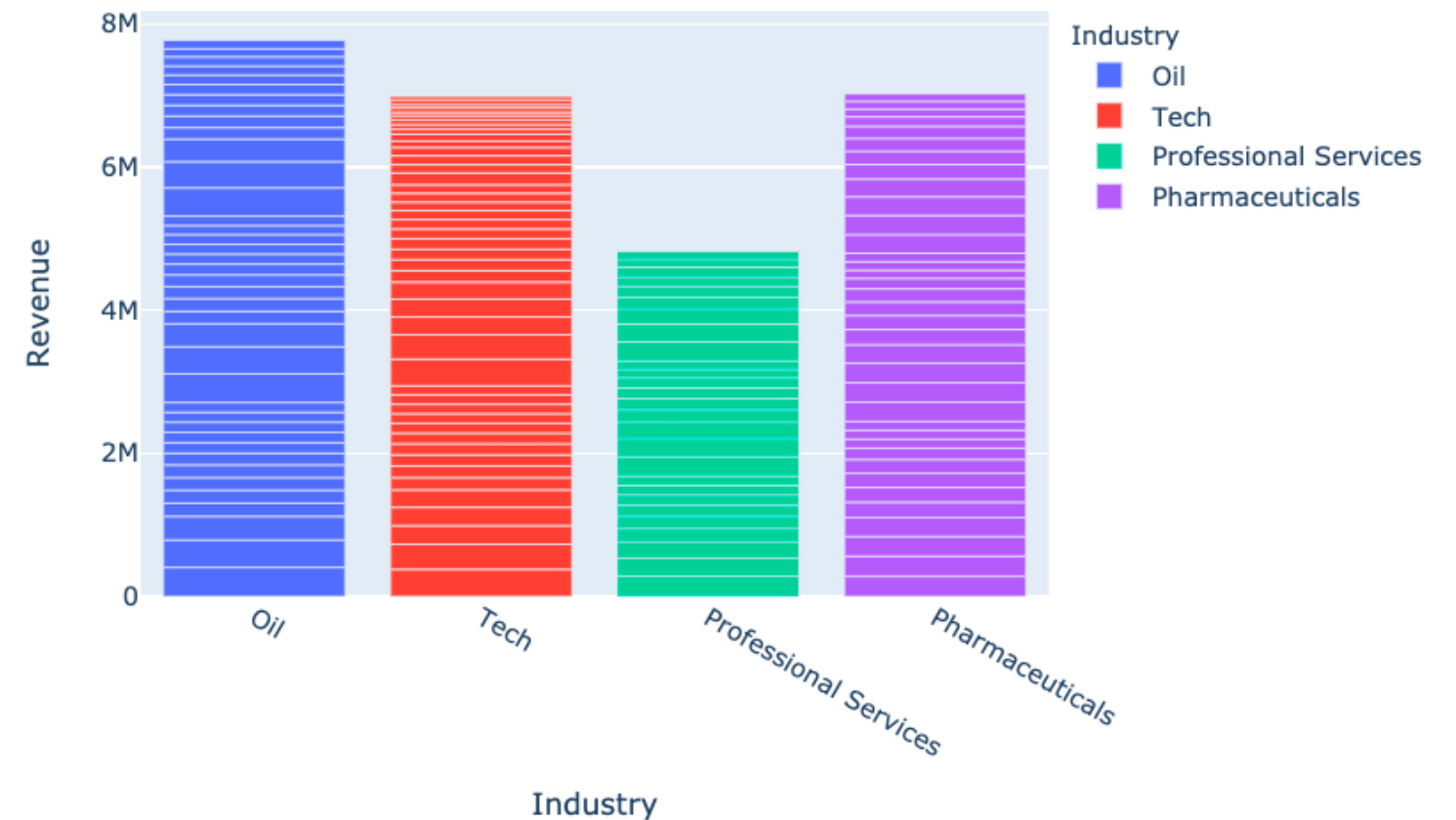
- **type** : `buttons` or `dropdown`
  - We will cover dropdowns later!
- **direction** : Button orientation
  - Buttons can be beside ( `left` ) or on top of ( `down` ) each other
- **x / y** : Floats to set the button positions as you have done before
- **showactive** : `True` / `False` to show the `active` (index of button) as pressed or not.
  - The active button is the currently selected one.
- **buttons** : A list of `button` objects

# Plot type with buttons

Let's first set up a bar chart:

```
fig = px.bar(  
    data_frame=revenues,  
    x='Industry', y='Revenue',  
    color='Industry')  
fig.show()
```

Our simple bar chart:



# Button set up

Create the buttons to switch plot type:

```
my_buttons = [  
    {'label': "Bar plot",  
     'method': "update",  
     'args': [{"type": "bar"}]},  
    {'label': "scatterplot",  
     'method': "update",  
     'args': [{"type": "scatter", 'mode': 'markers'}]}  
]
```

# The args argument

One of the most confusing arguments in Plotly!

- Its structure is:

```
[{dictionary to send to data},  
{dictionary to send to layout}]
```

- See what happens when we use Python's `dir` on our figure object to see the internal structure
  - There are some familiar faces! (much more is printed)

```
data  
for_each_annotation  
for_each_coloraxis  
for_each_geo  
for_each_layout_image  
for_each_mapbox  
for_each_polar  
for_each_scene  
for_each_shape  
for_each_ternary  
for_each_trace  
for_each_xaxis  
for_each_yaxis  
frames  
get_subplot  
layout  
plotly_relayout  
plotly_restyle  
plotly_update  
pop  
print_grid  
select_annotations  
select_coloraxes  
select_geos  
select_layout_images  
select_mapboxes  
select_polars  
select_scenes  
select_shapes  
select_ternaries  
select_traces  
select_xaxes  
select_yaxes  
show
```

# Using args for layout updates

Let's see what is inside the figure's `layout` element:

```
dir(fig.layout)
```

```
['activeshape', 'angularaxis', 'annotationdefaults', 'annotations', 'autosize', 'bargap', 'bargroupgap', 'barmode', 'barnorm', 'boxgap', 'boxgroupgap', 'boxmode', 'calendar', 'clickmode', 'coloraxis', 'colorscale', 'colorway', 'datarevision', 'direction', 'dragmode', 'editrevision', 'extendfunnelareacolors', 'extendpiecolors', 'extendsunburstcolors', 'extendtreemapcolors', 'figure', 'font', 'funnelareacolorway', 'funnelgap', 'funnelgroupgap', 'funnelmode', 'geo', 'grid', 'height', 'hiddenlabels', 'hiddenlabelsrc', 'hidesources', 'hoverdistance', 'hoverlabel', 'hovermode', 'imagedefaults', 'images', 'legend', 'mapbox', 'margin', 'meta', 'metasrc', 'modebar', 'newshape', 'on_change', 'orientation', 'paper_bgcolor', 'parent', 'piecolorway', 'plot_bgcolor', 'plotly_name', 'polar', 'pop', 'radialaxis', 're', 'scene', 'selectdirection', 'selectionrevision', 'separators', 'shapedefaults', 'shapes', 'showlegend', 'sliderdefaults', 'sliders', 'spikedistance', 'sunburstcolorway', 'template', 'ternary', 'title', 'titlefont', 'to_plotly_json', 'transition', 'treemapcolorway', 'uirevision', 'uniformtext', 'update', 'updatemenudefaults', 'updatemenus', 'violingap', 'violingroupgap', 'violinmode', 'waterfallgap', 'waterfallgroupgap', 'waterfallmode', 'width', 'xaxis', 'yaxis']
```

Phew! There are many, but some should be familiar.

# Using args for data updates

Let's also look at what is inside the figure's `data` element (of the first trace):

```
dir(fig.data[0])
```

```
['alignmentgroup', 'base', 'basesrc', 'claponaxis', 'constrainttext', 'customdata', 'customdatasrc', 'd', 'x', 'dy', 'error_x', 'error_y', 'figure', 'hoverinfo', 'hoverinfosrc', 'hoverlabel', 'hovertexttemplate', 'hovertexttemplatesrc', 'hovertext', 'hovertextsrc', 'ids', 'idsrc', 'insidetextanchor', 'insidetextfont', 'legendgroup', 'marker', 'meta', 'metasrc', 'name', 'offset', 'offsetgroup', 'offsetsrc', 'on_change', 'on_click', 'on_deselect', 'on_hover', 'on_selection', 'on_unhover', 'opacity', 'orientation', 'outside textfont', 'parent', 'plotly_name', 'pop', 'r', 'rsrc', 'selected', 'selectedpoints', 'showlegend', 'stream', 't', 'text', 'textangle', 'textfont', 'textposition', 'textpositionsrc', 'textsrc', 'texttemplate', 'texttemplatesrc', 'to_plotly_json', 'tsrc', 'type', 'uid', 'uirevision', 'unselected', 'update', 'visible', 'width', 'widthsrc', 'x', 'x0', 'xaxis', 'xcalendar', 'xsrc', 'y', 'y0', 'yaxis', 'ycalendar', 'ysrc']
```

Some are familiar and some are worth noting for later!

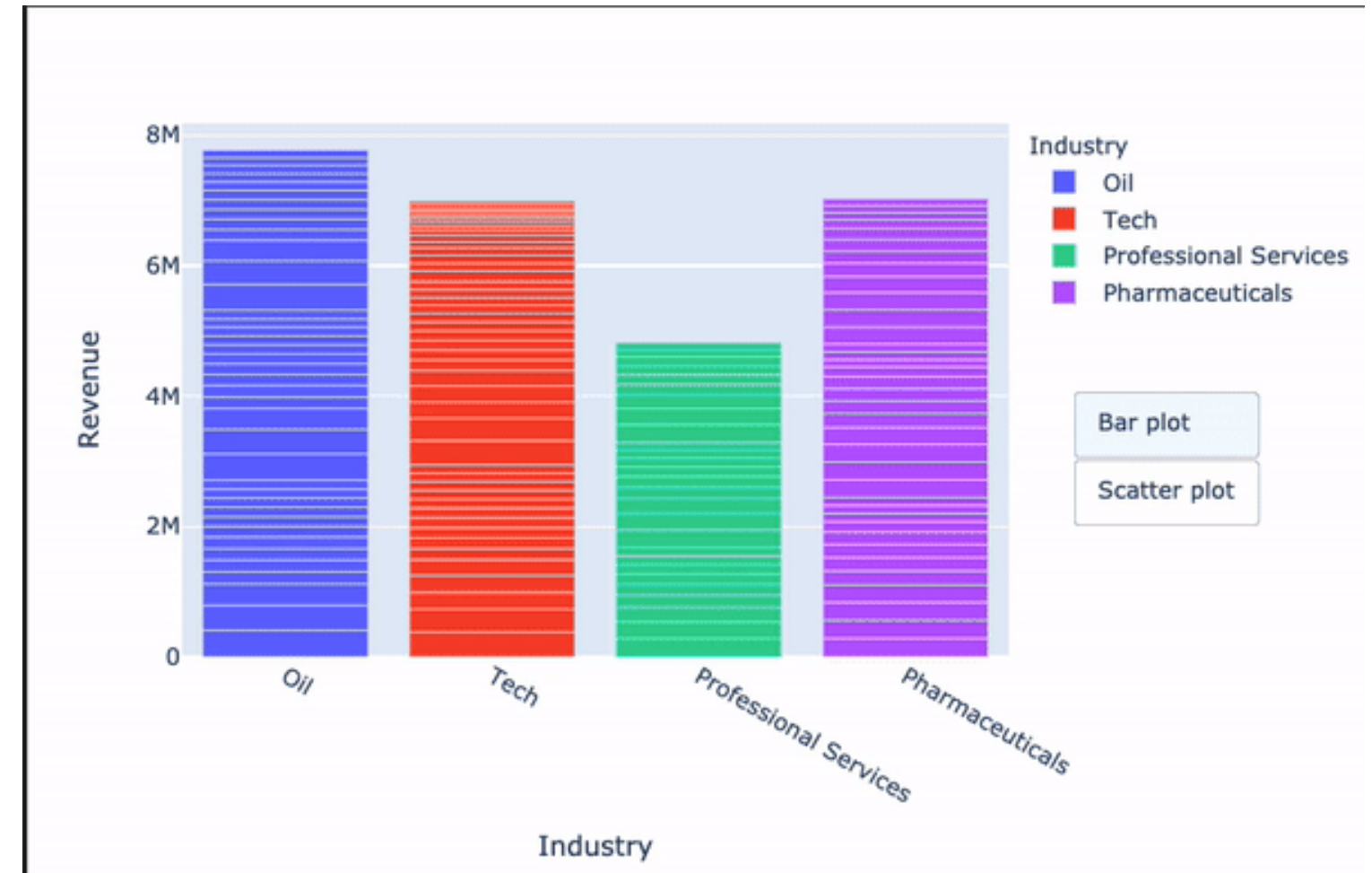


# Button interactivity

Set the button placement, stacking, and focus:

```
fig.update_layout({
    'updatemenus': [{
        'type': "buttons",
        'direction': 'down',
        'x': 1.3, 'y': 0.5,
        'showactive': True,
        'active': 0,
        'buttons': my_buttons}]
})
fig.show()
```

Our buttons at work!



# Let's practice!

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# Dropdowns

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# What is a dropdown?

- Allows user to select from a set of options
- These options will alter the plot in various ways



# Dropdowns in Plotly

Dropdowns are created very similarly to buttons.

Create a figure and loop through DataFrames to add traces:

```
fig = go.Figure()
for suburb in ['Ashfield', 'Lidcombe', 'Bondi Junction']:
    df = syd_houses[syd_houses.Suburb == suburb]
    fig.add_trace(go.Bar(x=df['Year'], y=df['Median House Price'], name=suburb))
```

Why so many traces? Our dropdown is going to show/hide different ones!

# Hiding a trace

Recall what we can update in a figure's `data` element?

- The `visible` argument determines whether traces are visible (`True`) or not (`False`)
- We could use `args` to update the `visible` argument of different traces

```
args:[{'visible': [True, False, False]}]
```

- We can use a list for the `args` value to update all three traces

```
[ 'alignmentgroup', 'baseline', 'color', 'dash', 'dy', 'error_x', 'error_y',  
  'font', 'height', 'hovertemplatesrc', 'hovertext', 'legendgroup', 'marker',  
  'name', 'on_click', 'on_deselect', 'on_hover', 'parent', 'textfont', 'parent', 'p',  
  'text', 'textsrc', 'texttemplate', 'texttemplatesrc', 'texttemplateupdate',  
  'visible', 'width', 'widthupdate', 'x', 'x2', 'y', 'y2', 'yerr' ]
```

# The dropdown object

The dropdown object, like the button object, is also a list with the same arguments.

```
# Create the dropdown
dropdown_buttons = [
    {'label': 'Ashfield', 'method': 'update',
     'args': [{ 'visible': [True, False, False] },
              {'title': 'Ashfield'}]},
    {'label': 'Lidcombe', 'method': 'update',
     'args': [{ 'visible': [False, True, False] },
              {'title': 'Lidcombe'}]},
    {'label': "Bondi Junction", 'method': "update",
     'args': [{"visible": [False, False, True]},
              {'title': 'Bondi Junction'}]}
]
```

# Adding the dropdown

Adding the dropdown is also very similar:

```
fig.update_layout({
    'updatemenus': [{
        'type': "dropdown",
        'x': 1.3,
        'y': 0.5,
        'showactive': True,
        'active': 0,
        'buttons': dropdown_buttons}]
})
fig.show()
```

Our dropdown:





# Let's practice!

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# Sliders

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# What are sliders?

- An interactive element to toggle between values and update your plot
- Often used for viewing data over time, such as data from different years
- Can be used for any group, such as penguin islands
- Ensure it makes sense in your plot

A year slider:



A penguin island slider:



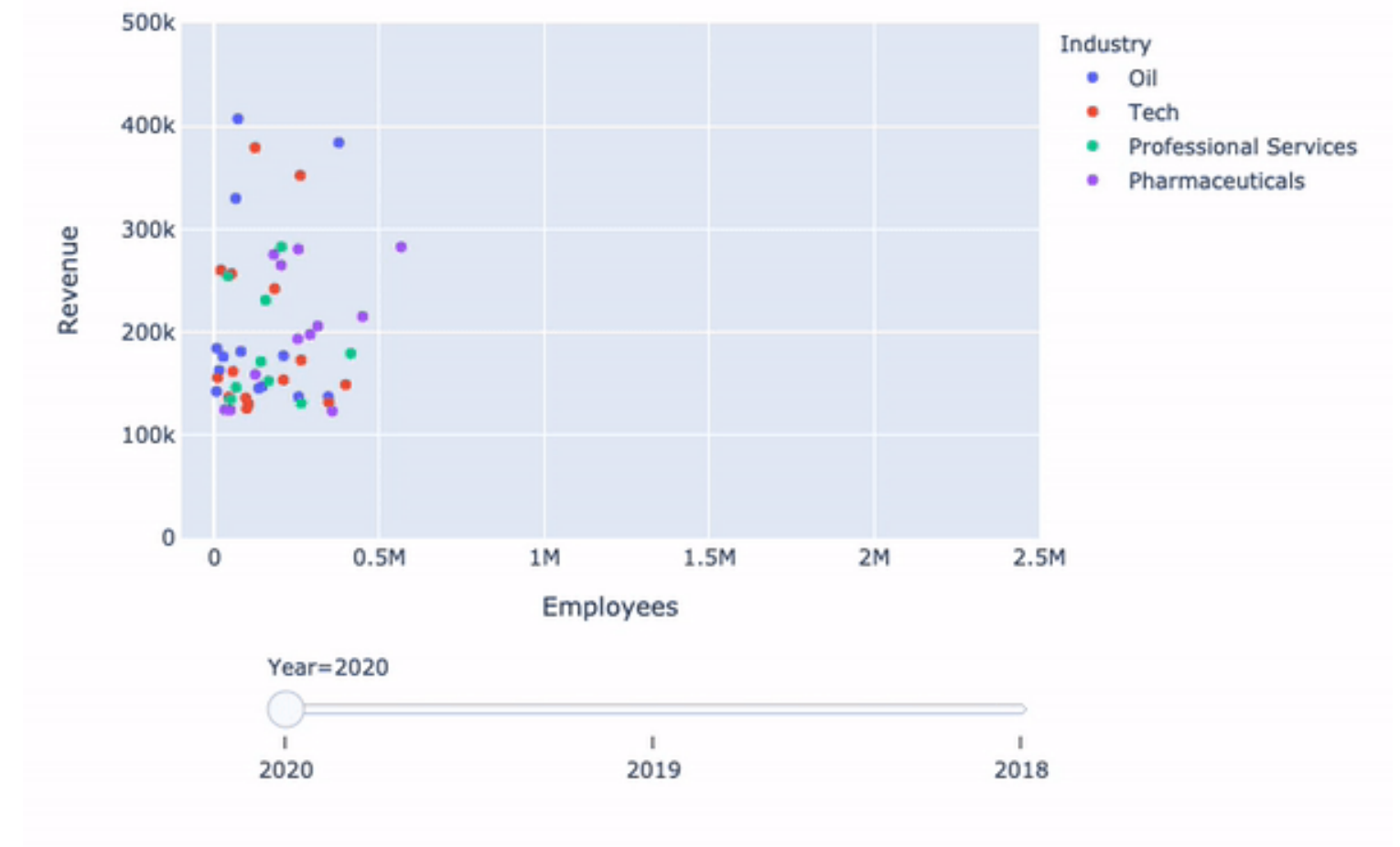
# Sliders in plotly.express

`plotly.express` allows sliders via the `animation_frame` and `animation_group` arguments

- `animation_frame` : What will be on the slider (`Year` or `Island` on previous slide)
- `animation_group` : How to tell Plotly it is the same object over time

# Revenue vs. Employees with slider

```
fig = px.scatter(  
    data_frame=revenues,  
    y='Revenue',  
    x='Employees',  
    color='Industry',  
    animation_frame='Year',  
    animation_group='Company')  
  
fig.update_layout(  
    'yaxis': {'range': [0, 500000]},  
    'xaxis': {'range': [-100000, 2500000]}  
})  
  
fig['layout'].pop('updatemenus')  
fig.show()
```



# plotly.express limitation: animate method

`plotly.express` sliders have a key limitation - the `animation` slider method

In the `Figure` object

```
fig['layout']['sliders'][0].steps[0]['method']
```

`animate`

- With `plotly.express`, you can't update data or layout — only animate the **same data point** over different 'frames'.
- To solve this, we need to use `graph_objects` to create the slider

# Sliders with `graph_objects`

To use `graph_objects`, we need to:

1. Create a figure object with necessary traces
2. Create a sliders object to show/hide traces
3. Update the layout to add the slider to the figure

# Creating the figure

Let's create the figure and add traces

```
fig = go.Figure()
for island in ['Torgersen', 'Biscoe', 'Dream']:
    df = penguins[penguins.Island == island]
    fig.add_trace(go.Scatter(
        x=df["Culmen Length (mm)"],
        y=df["Culmen Depth (mm)"], mode='markers', name=island))
```



# Creating the slider

Let's create the slider object:

```
sliders = [  
    {'steps': [  
        {'method': 'update', 'label': 'Torgersen',  
         'args': [{'visible': [True, False, False]}]},  
        {'method': 'update', 'label': 'Bisco',  
         'args': [{'visible': [False, True, False]}]},  
        {'method': 'update', 'label': 'Dream',  
         'args': [{'visible': [False, False, True]}]}  
    ]}  
]
```

More formatting options available in the [docs](#)!

# Adding the slider

Now we can add the slider to our figure:

```
fig.update_layout({'sliders': sliders})  
fig.show()
```

The first screen was a bit funny huh? Let's fix that!



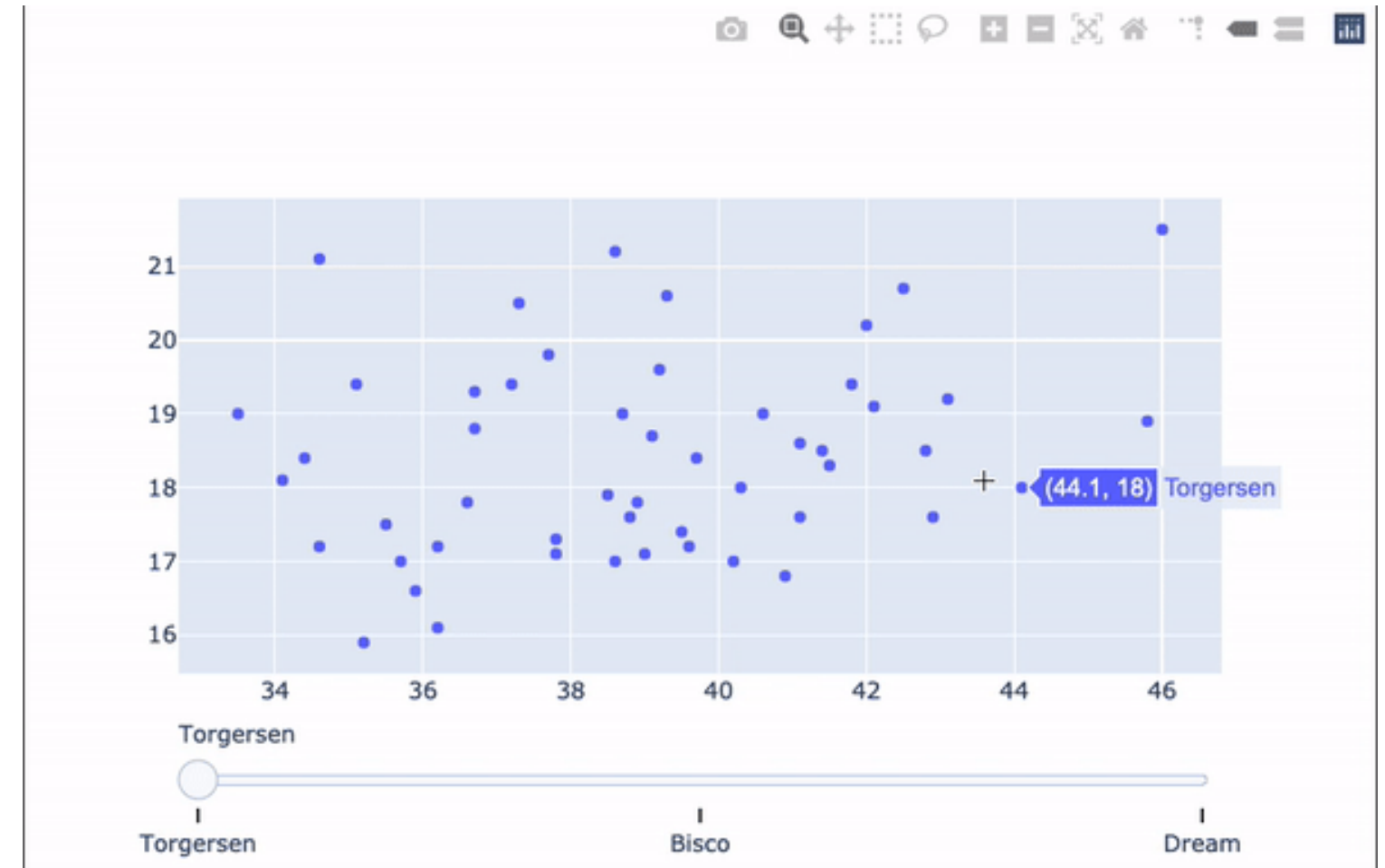
# Fixing the initial display

We can fix the initial display by setting only the relevant traces to show.

```
# Make traces invisible
fig.data[1].visible=False
fig.data[2].visible=False

fig.update_layout({'sliders': sliders})
fig.show()
```

Much better!



# Let's practice!

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# What you learned

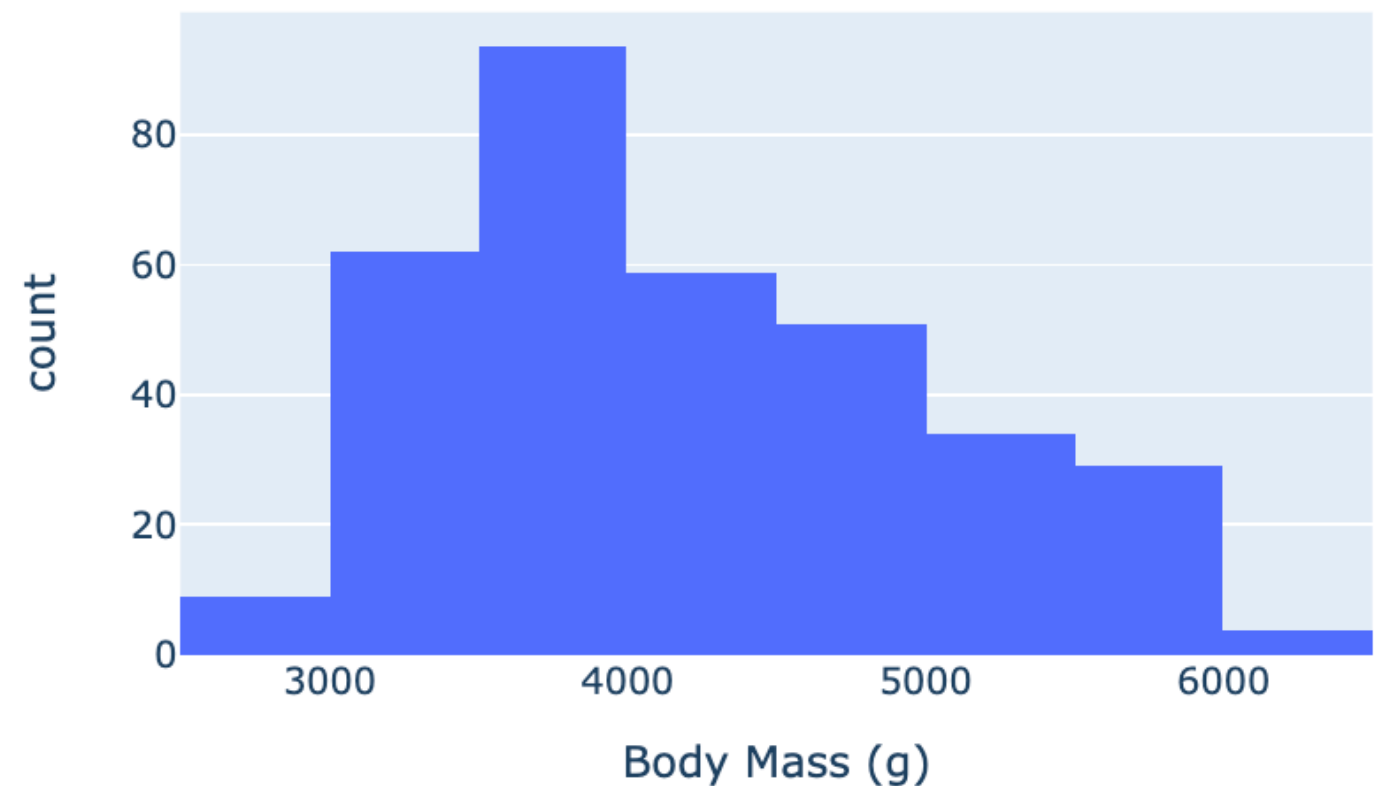
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# Chapter 1

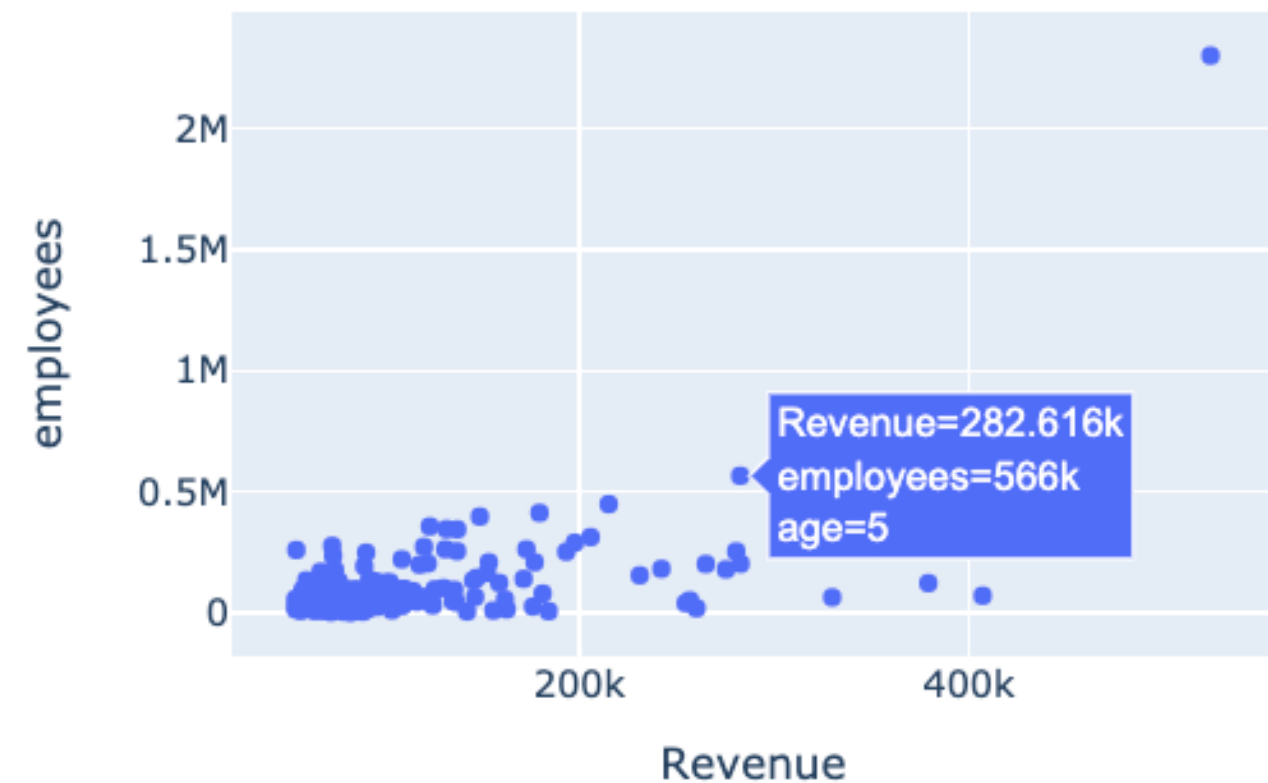
- The Plotly figure
- Univariate plots such as box plots and histograms
- Styled plots using color



# Chapter 2

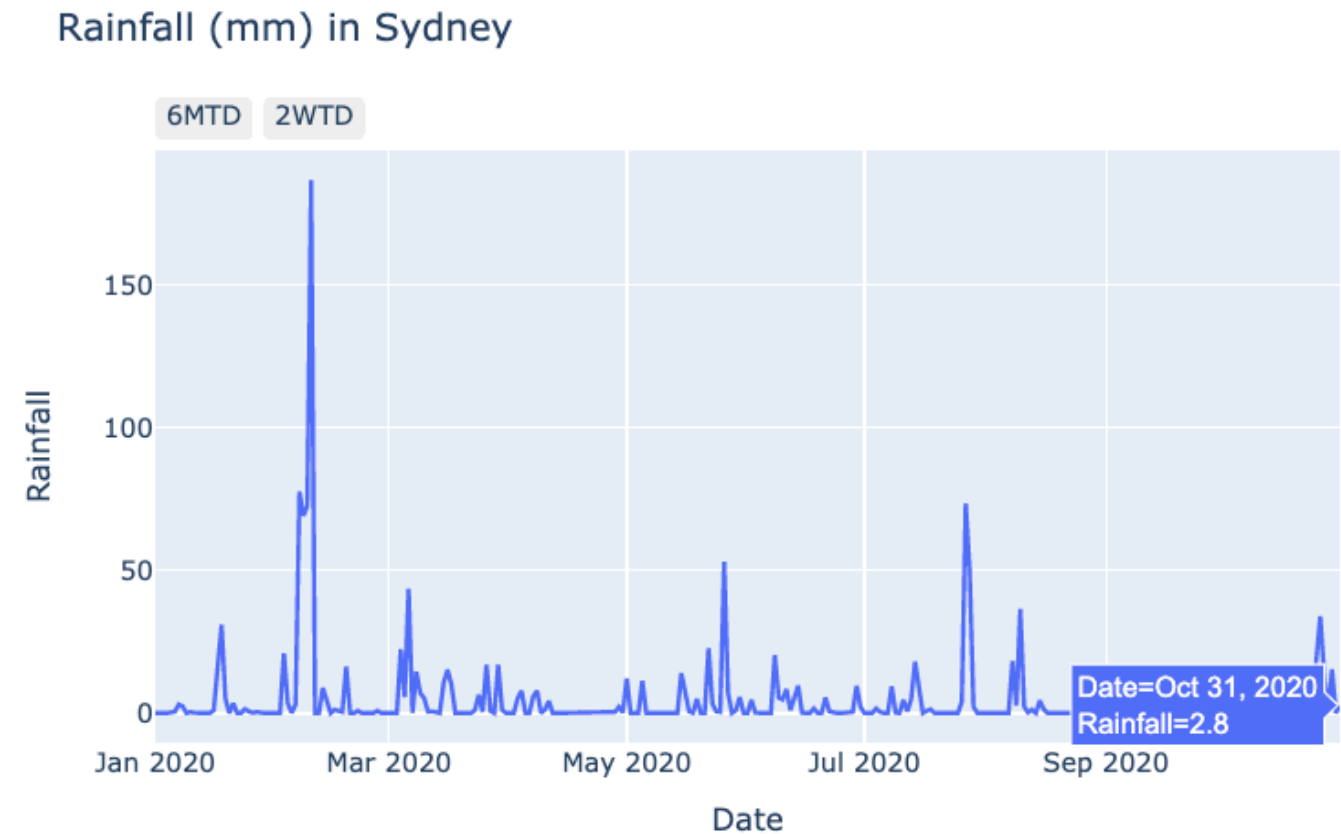
- Bivariate visualizations such as scatterplots and bar plots
- Customized your plots further with:
  - Hover information and legends
  - Annotations
  - Custom plot axes

Recall seeing company `age` (another variable) in the hover!



# Chapter 3

- Advanced customization
  - Subplots of same or different types
  - Layering multiple plots on the same chart
  - An introduction to time buttons





# Chapter 4

Using interactive elements:

- Buttons
- Dropdowns
- Sliders

Your houses dropdown:



# Thank you!

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