

Between-element interactivity

BUILDING DASHBOARDS WITH DASH AND PLOTLY



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What is `between-element`?

- Previously: Interact with `input` (e.g., dropdown); to trigger change in a figure
- Now: Interact with `figure`; to trigger change in a figure
- Two specific ways:
 - Hover to filter and regenerate (via callback)
 - Click to filter and regenerate (via callback)

The hoverData property

A familiar bar chart and text component:

```
# Create figure & dash.Dash()
html.Div(children=[
    dcc.Graph(id='bar_fig',
              figure=ecom_bar),
    html.Br(),
    html.H2("The Hover Data:"),
    html.P(id='text_output')
```

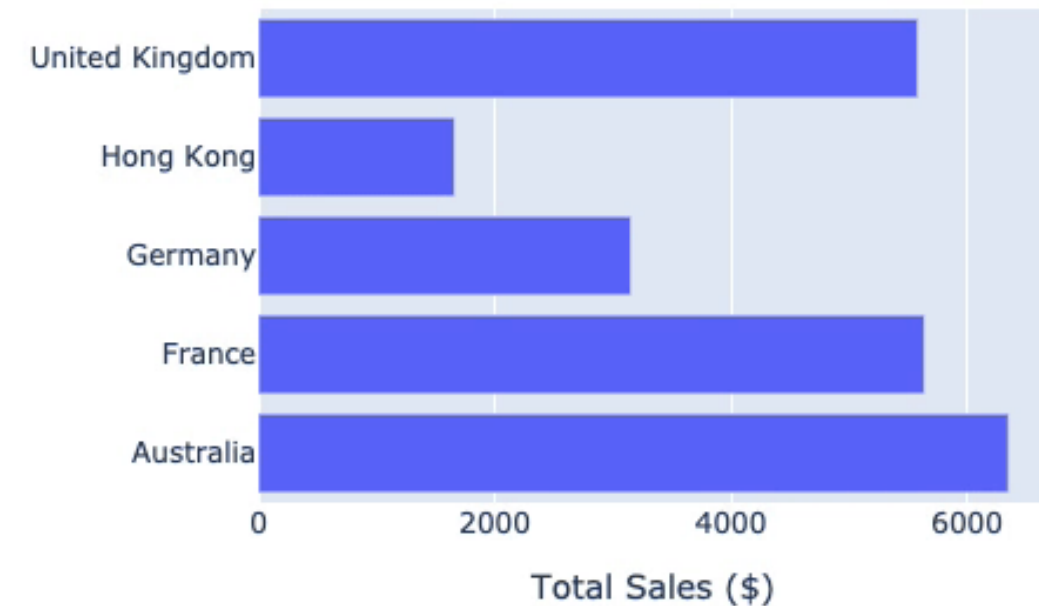
Set up a callback

```
@app.callback(
    Output('text_output', 'children'),
    Input('bar_fig', 'hoverData'))
def capture_hover_data(hoverData):
    return str(hoverData)
```

Our first hover

What happens:

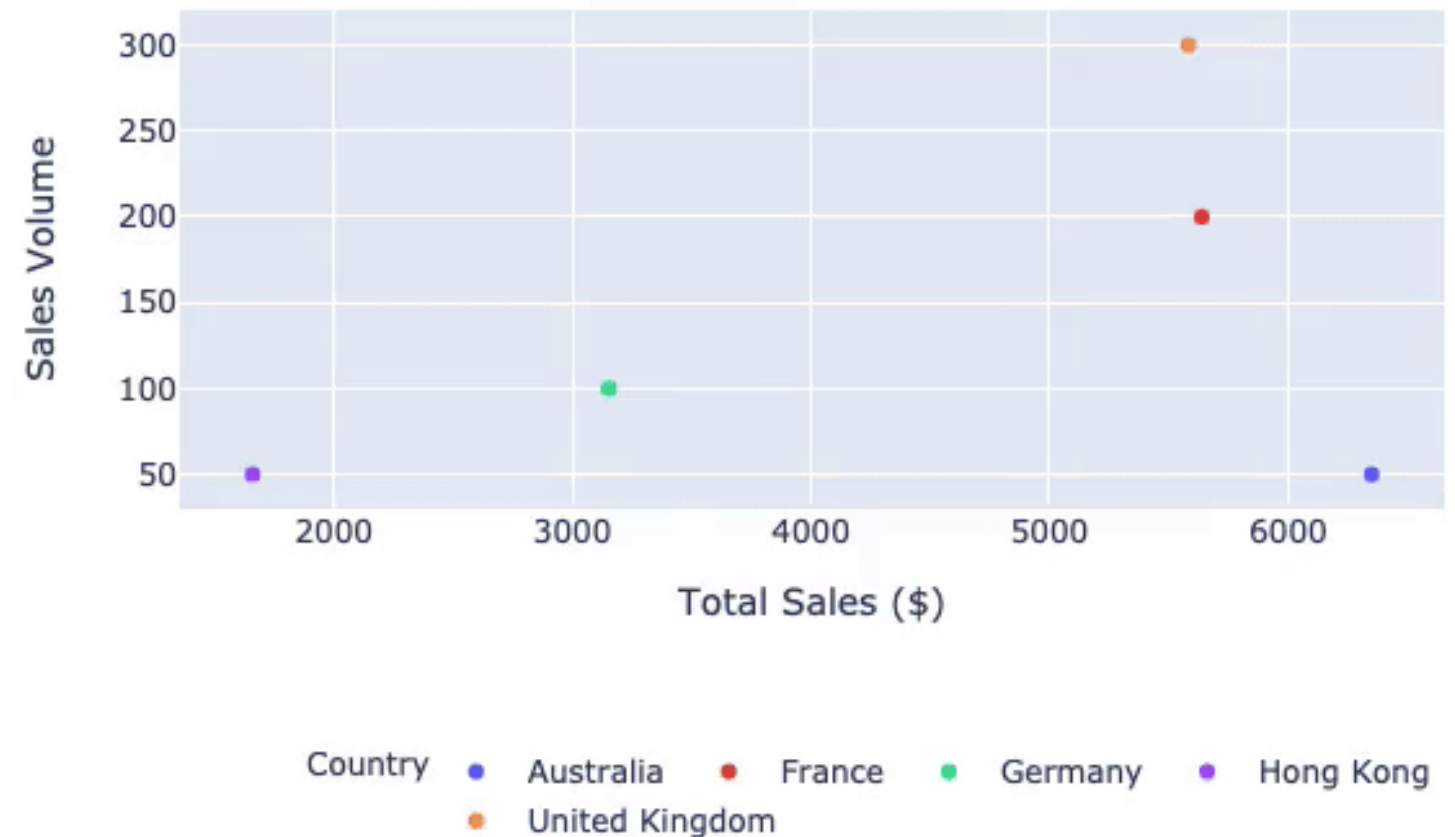
- User hovers: `hoverData` property of the figure changes
- Callback takes and returns this to `.P()` tag
- We can see point-related information
 - Now: Use that information!



The Hover Data:
None

Beware missing info

- Aim: Use 'country' in the callback (filter and regenerate a graph)
 - Previous example - in `hoverData`
- See this scatter plot (graph type and relevant ID's updated)
 - There is no country!



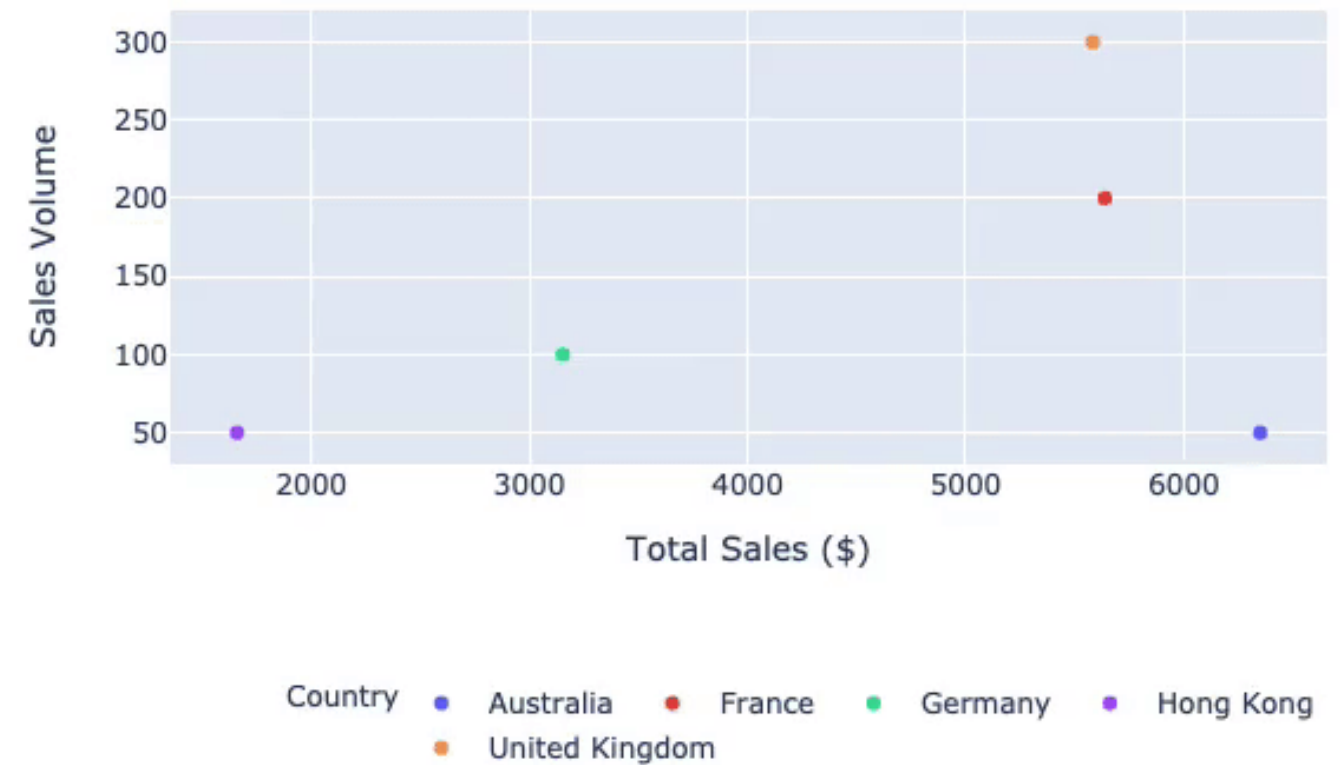
The Hover Data:

None

Adding custom data

```
ecom_scatter = px.scatter(ecom_data,  
    x='Total Sales ($)',  
    y='Sales Volume', color='Country',  
    custom_data=['Country'])
```

- Now `customData` contains the country!



The Hover Data:

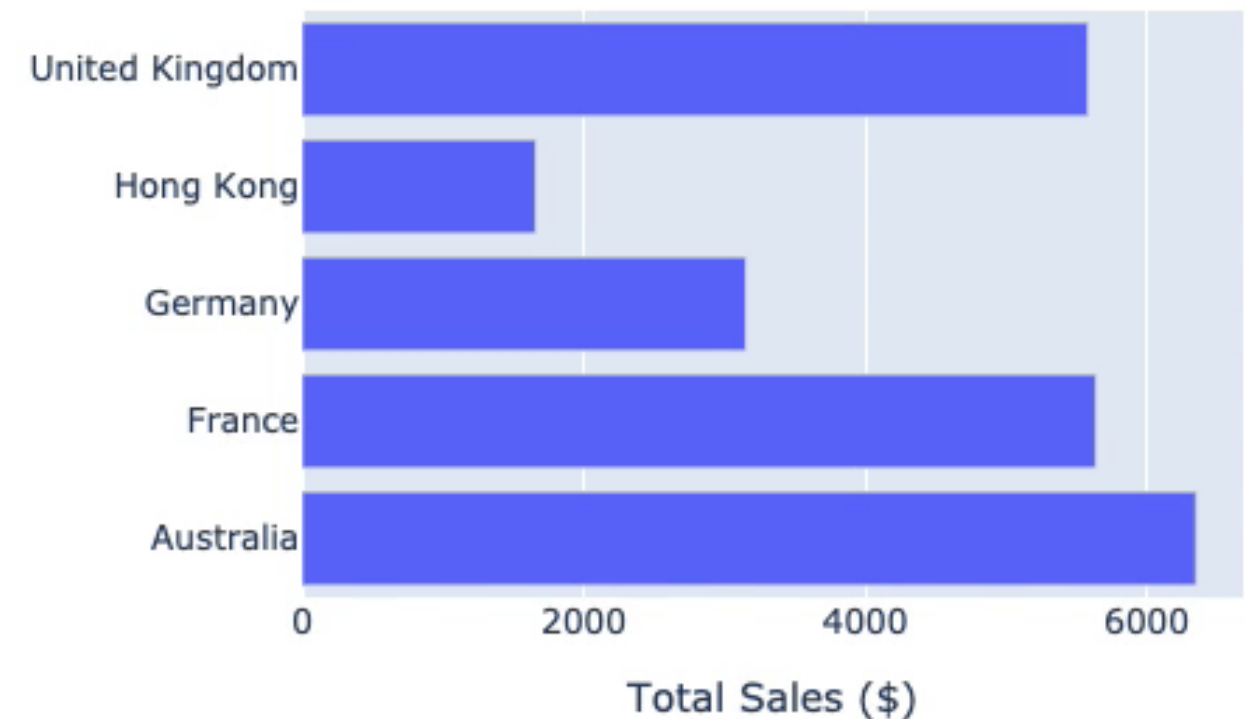
None

What about clicking?

- Can also trigger a callback when a point is clicked
 - Only one change required (`clickData` property)

```
@app.callback(  
    Output('text_output', 'children'),  
    Input('bar_fig', 'clickData'))  
def capture_hover_data(clickData):  
    return str(clickData)
```

- Notice: Did not immediately appear



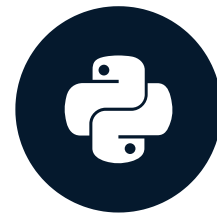
The Click Data:
None

Let's practice!

BUILDING DASHBOARDS WITH DASH AND PLOTLY

Chained callbacks

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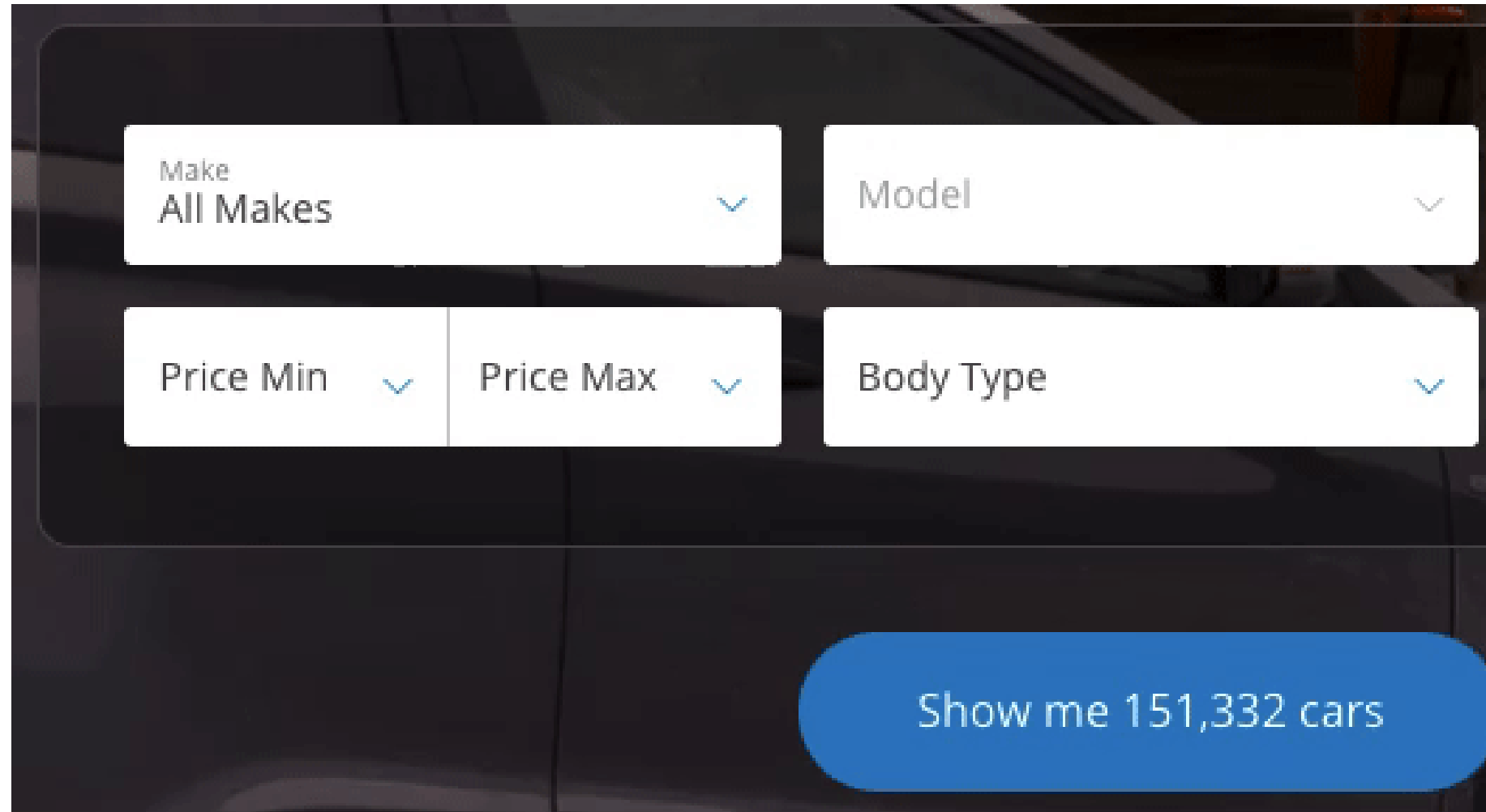
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Why chain callbacks?

- So far callbacks cause:
 - Regenerate plots
 - Change HTML / text
- What about callback triggering another callback?
- Use case: conditional dropdown

Let's do this in Dash!

A common example



A car search filter interface. It features five dropdown menus arranged in two rows. The first row contains 'Make' (set to 'All Makes') and 'Model'. The second row contains 'Price Min' and 'Price Max' side-by-side, followed by 'Body Type'. All dropdowns have a blue chevron icon on the right. Below the filters is a large blue button with the text 'Show me 151,332 cars'.

Make
All Makes

Model

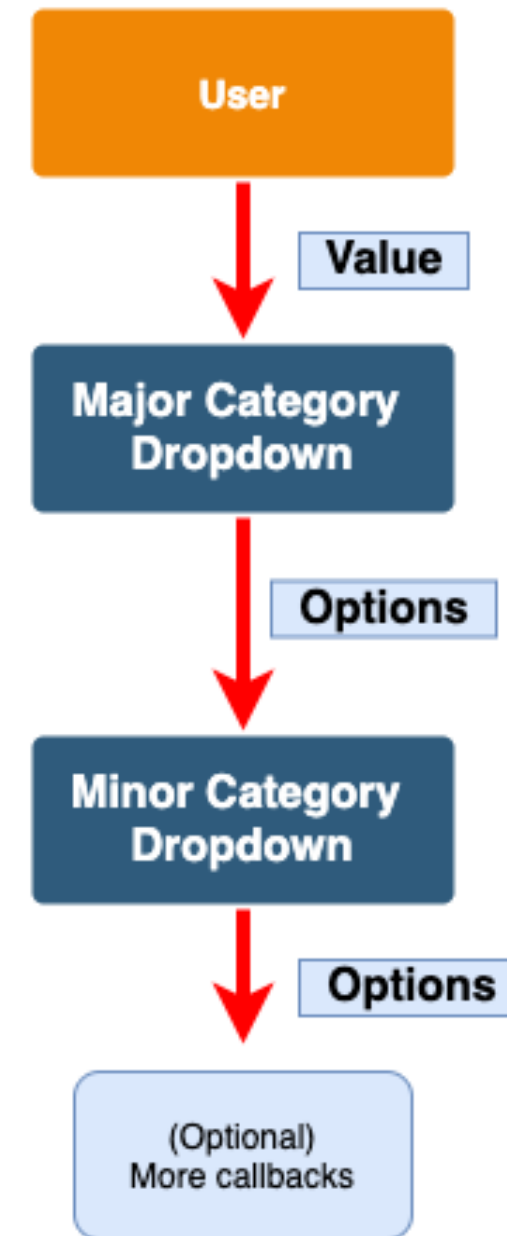
Price Min Price Max

Body Type

Show me 151,332 cars

Inputs and outputs

- The trick: be aware of callback pathways (inputs and outputs)
- Helpful tool: an input-output diagram
- The flow:
 - User changes `value` of first dropdown (**INPUT**)
 - A callback subsets and returns `options` of second dropdown (**OUTPUT**)
 - Another callback could be triggered (**INPUT**) by `options` change on second dropdown, and so on



Chained callbacks in Dash

The callbacks involved:

```
@app.callback(  
    Output('minor_cat_dd', 'options'),  
    Input('major_cat_dd', 'value'))  
def update_dd(major_cat_dd):  
    # Filter options (list of dicts)  
    return minor_options
```

Set a default value

```
@app.callback(  
    Output('minor_cat_dd', 'value'),  
    Input('minor_cat_dd', 'options'))  
def update_dd(minor_cat_options):  
    # Pick a default value  
    return chosen_value
```

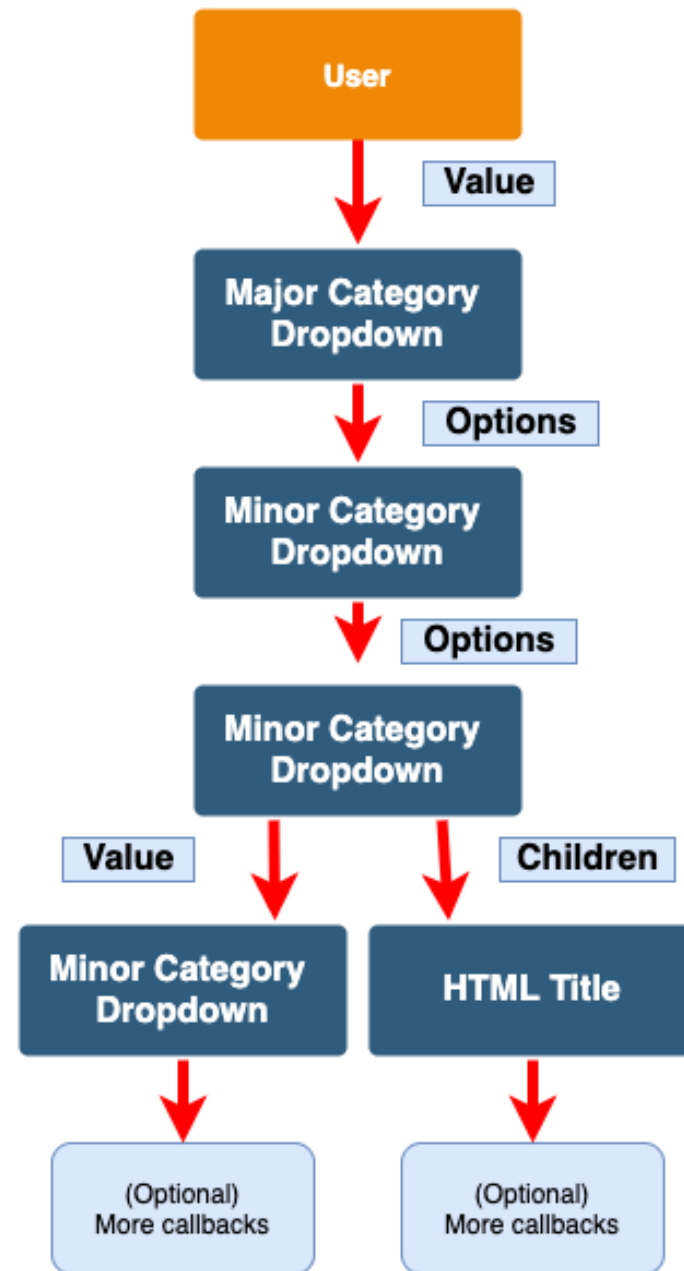
Multiple outputs

May wish to update multiple elements

- In our example: update a HTML title as well
- Add another output

```
@app.callback(  
    Output('my_title', 'children'),  
    Output('minor_cat_dd', 'value'),  
    Input('minor_cat_dd', 'options')  
)  
  
def some_function(input):  
    # function body  
    return title_value, dropdown_value
```

Multiple outputs diagram



Let's practice!

BUILDING DASHBOARDS WITH DASH AND PLOTLY

Dash Data Table introduction

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What is a Dash Data Table?

- HTML has a native table tag (available in **Dash** `html.Table()`)
- Problem: HTML tables are static
- Introducing Dash Data Tables (component for the `app.layout`)
 - Many visual & interactive customizations
 - e.g., Filter, hiding, export, pagination, hover, styling
 - Enhance user experience

The basic table

```
from dash_table import DataTable
d_columns = [
    {"name": 'Major Category',
     "id": "Major Category"},
    {"name": 'Total Sales ($)',
     "id": "Total Sales ($)"},
    {"name": 'Sales Volume',
     "id": "Sales Volume"}]
```

```
d_table = DataTable(
    columns=d_columns,
    data=major_cat_tb.to_dict('records'),
    cell_selectable = False)
```

Major Category	Total Sales (\$)	Sales Volume
Clothes	4950.3700000000002	176
Garden	6040.0800000000002	189
Household	4986.5800000000001	163
Kitchen	6407.9	172

Format the numbers

- Problem 1: Financial number formatting
 - Solution: `FormatTemplate`

```
from dash_table import FormatTemplate
money_format = FormatTemplate.money(2)
d_columns=[{"name": 'Total Sales ($)',
            "id": "Total Sales ($)",
            'type': 'numeric',
            'format': money_format}
            # Other column definitions
]
```

Nicely formatted!

Major Category Stats

Major Category	Total Sales (\$)	Sales Volume
Clothes	\$4,950.37	176
Garden	\$6,040.08	189
Household	\$4,986.58	163
Kitchen	\$6,407.90	172

Add sorting

Adding sorting:

```
d_table = DataTable(  
    columns=d_columns,  
    data=major_cat_tb.to_dict('records'),  
    cell_selectable=False,  
    # Add sort ability  
    sort_action='native')
```

With Sorting:

Major Category	Total Sales (\$)	Sales Volume
Clothes	\$4,950.37	176
Garden	\$6,040.08	189
Household	\$4,986.58	163
Kitchen	\$6,407.90	172

Add filtering

Adding Filtering:

```
d_table = DataTable(  
    columns=d_columns,  
    data=major_cat_tb.to_dict('records'),  
    cell_selectable=False,  
    # Add filter ability  
    filter_action='native'  
)
```

With Filtering:

Major Category	Total Sales (\$)	Sales Volume
filter data...		
Clothes	\$4,950.37	176
Garden	\$6,040.08	189
Household	\$4,986.58	163
Kitchen	\$6,407.90	172

Pagination

Problem: long tables

- Pagination: show (n) entries per 'page' with navigation buttons
 - `page_current` = page to start on
 - `page_size` = entries per page

```
d_table = DataTable(  
    # Previous options  
    page_current= 0,  
    page_size= 2,  
    page_action="native")
```

Pagination in action:

- Next, previous, first and last buttons
- Enter page number
- Filter and sort still works!

Major Category	Total Sales (\$)	Sales Volume
filter data...		
Clothes	\$4,950.37	176
Garden	\$6,040.08	189

<< < 1 / 2 > >>

Let's practice!

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Dash Data Table interactivity

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Styling all Data Table cells

- Can't use the 'style'
- For all cells use `style_cell`

```
d_table = DataTable(  
    # Other table properties  
    style_cell=(  
        {'textAlign': 'left'}  
    ))
```

Major Category	Total Sales (\$)
Clothes	\$4,950.37
Garden	\$6,040.08
Household	\$4,986.58
Kitchen	\$6,407.90

Styling some Data Table cells

- For a specific cell use `style_cell_conditional`

```
d_table = DataTable(  
    # Other table properties  
    style_cell=(  
        {'textAlign': 'left'}),  
    style_cell_conditional=[  
        {'if': {'column_id': 'Sales Volume'},  
         'textAlign': 'center'}]]
```

Major Category	Total Sales (\$)	Sales Volume
Clothes	\$4,950.37	176
Garden	\$6,040.08	189
Household	\$4,986.58	163
Kitchen	\$6,407.90	172

Styling Data Table headers

- Styling column headers is similar
 - All: `style_header`
 - Specific: `style_header_conditional`

```
d_table = DataTable(  
    # Other table properties  
    style_header={  
        'background-color': 'black',  
        'color': 'white'},  
    style_header_conditional=[  
        {'if': {'column_id': 'Sales Volume'},  
         'background-color': 'blue'}])
```

Styled column headers;

Major Category Stats

Major Category	Total Sales (\$)	Sales Volume
Clothes	\$4,950.37	176
Garden	\$6,040.08	189
Household	\$4,986.58	163
Kitchen	\$6,407.90	172

Selecting cells

- Selecting cells first (then rows, columns)
- Set DataTable's `cell_selectable` argument to `True`
- A callback to print available data

```
@app.callback(  
    Output('test_text', 'children'),  
    Input('my_dt', 'selected_cells'))  
def print_it(input):  
    return str(input)
```

Selecting cells:

Major Category Stats

Major Category	Total Sales (\$)	Sales Volume
Clothes	\$4,950.37	176
Garden	\$6,040.08	189
Household	\$4,986.58	163
Kitchen	\$6,407.90	172

Select output

None

Selecting rows

- Set Data Table `row_selectable` to `single` or `multi`
- A callback to print available data

```
@app.callback(  
    Output('test_text', 'children'),  
    Input('my_dt', 'selected_rows'))  
def print_it(input):  
    return str(input)
```

The row index is returned;

Major Category Stats

	Major Category	Total Sales (\$)	Sales Volume
<input type="radio"/>	Clothes	\$4,950.37	176
<input type="radio"/>	Garden	\$6,040.08	189
<input type="radio"/>	Household	\$4,986.58	163
<input type="radio"/>	Kitchen	\$6,407.90	172

Select output

None

Selecting columns

- Set Data Table `column_selectable` to `single` or `multi`
 - Add `'selectable': True` to column definitions
 - e.g.,

```
{"name": "Sales Volume", "id": "Sales Volume", "selectable": True}
```
- A callback to print available data

```
@app.callback(  
    Output('test_text', 'children'),  
    Input('my_dt', 'selected_columns'))  
def print_it(input):  
    return str(input)
```

Column ID is returned

Major Category Stats

	Major Category	Total Sales (\$)	Sales Volume
	Clothes	\$4,950.37	176
	Garden	\$6,040.08	189
	Household	\$4,986.58	163
	Kitchen	\$6,407.90	172

Select output

None

Let's practice!

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Wrap-up video

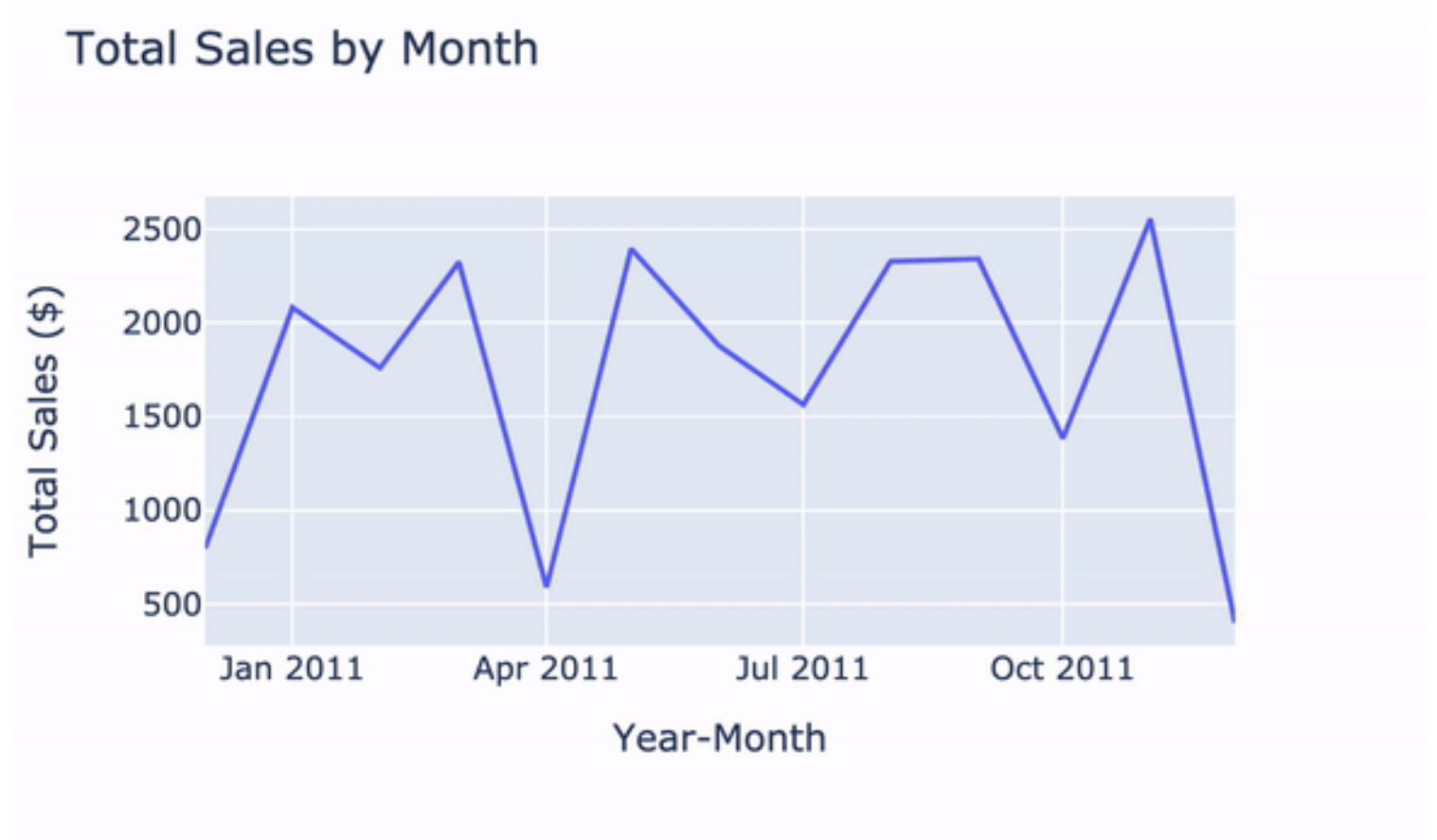
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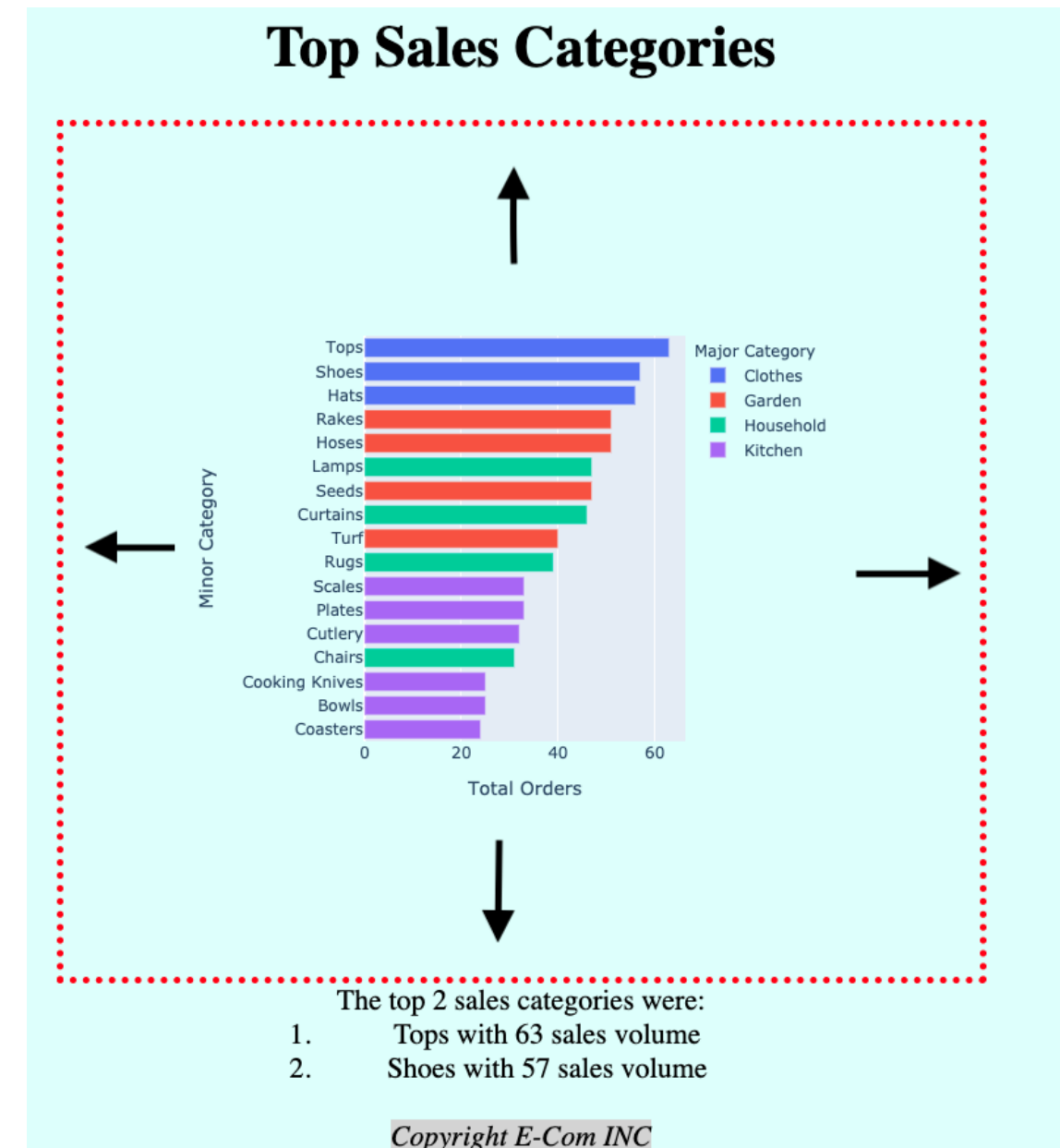
Chapter 1

- Revised Plotly, discovered Dash
- Created first Dash app
- An overview of HTML



Chapter 2

- Deeper dive into HTML and CSS
- Place, size, and style app elements
 - The important `style` dictionary



Chapter 3

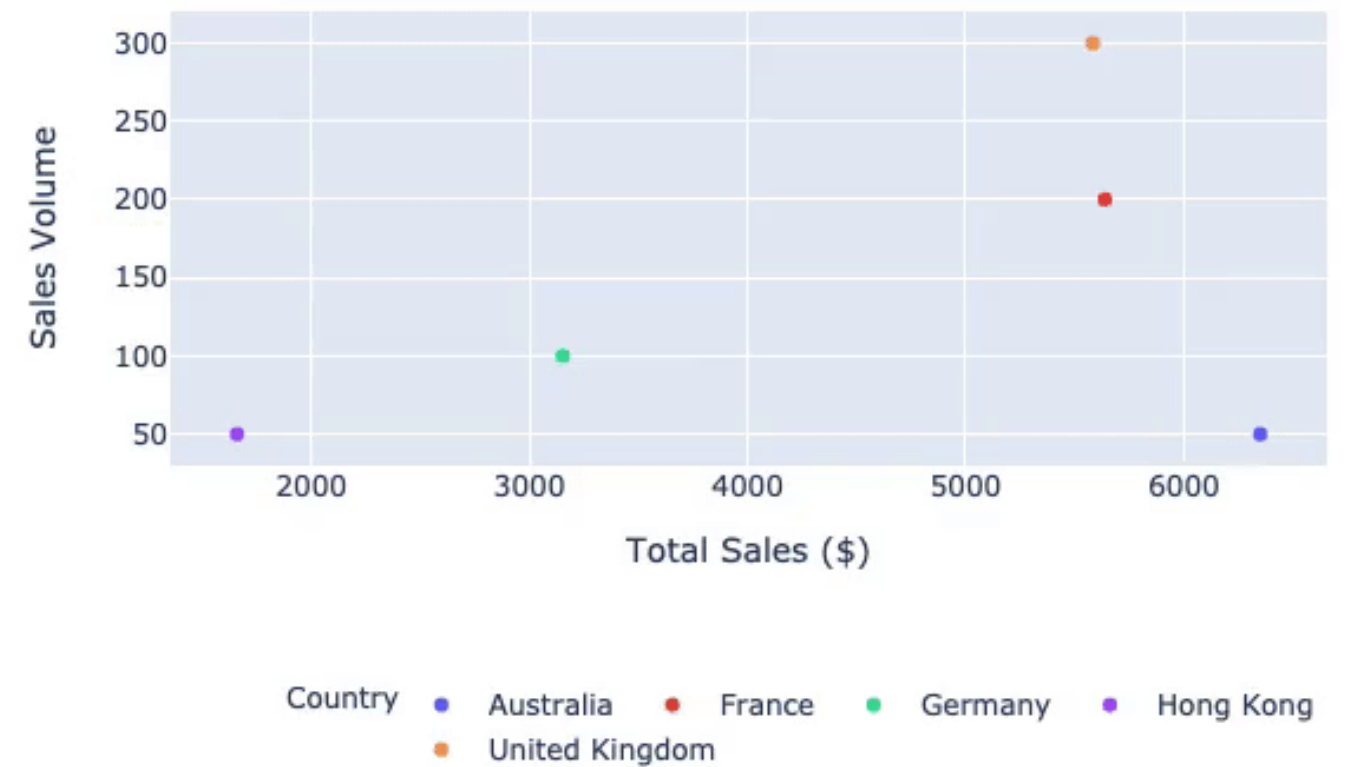
- Enhanced interactivity with callbacks
- Advanced user experiences with interactive components
 - Dropdowns, date pickers and free-text entry

07/01/2021

You have selected: July 01, 2021

Chapter 4

- Next level interactivity from hover and click
- Building Data Tables
 - Making them interactive



The Hover Data:

None

Next steps?

- Build your own dashboards (practice!)
- Experiment with callback chains
- Continue learning DataTable

Thank you!

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