Plotly graphs and figures

BUILDING DASHBOARDS WITH DASH AND PLOTLY

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What is Dash?

- A Python library for creating interactive web applications

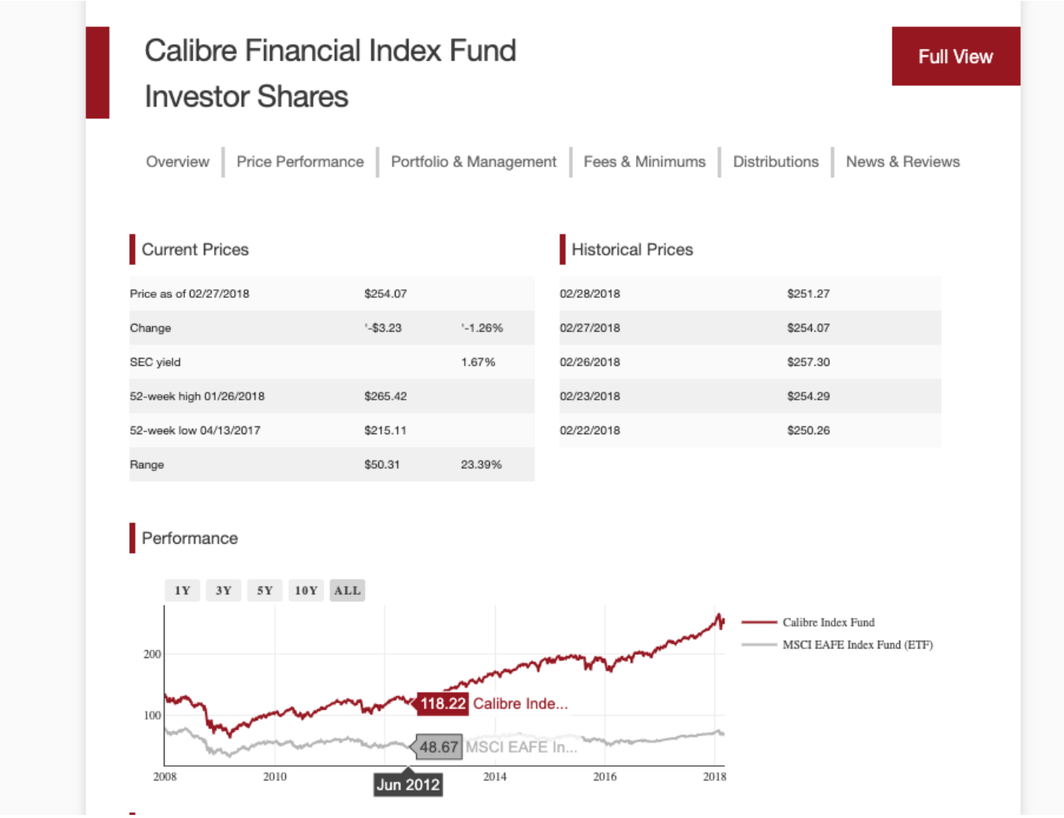
Advantages:

- Free! Unlike Tableau or PowerBI
- Harness JavaScript with only Python
- Less code than web application frameworks

Plotly and Dash

- Work well together

- Dash: Interactive dashboards with multiple Plotly graphs
- See this **example**
  - Images, text and charts
  - Check out the **source code**



What is Plotly?

- Refresh Plotly, focus on Dash
- A Python library for creating modern, interactive graphs
  - Wraps JavaScript but code in Python
- Create graphs with `plotly.express`

- Check out the **Introduction to Data Visualization with Plotly in Python**

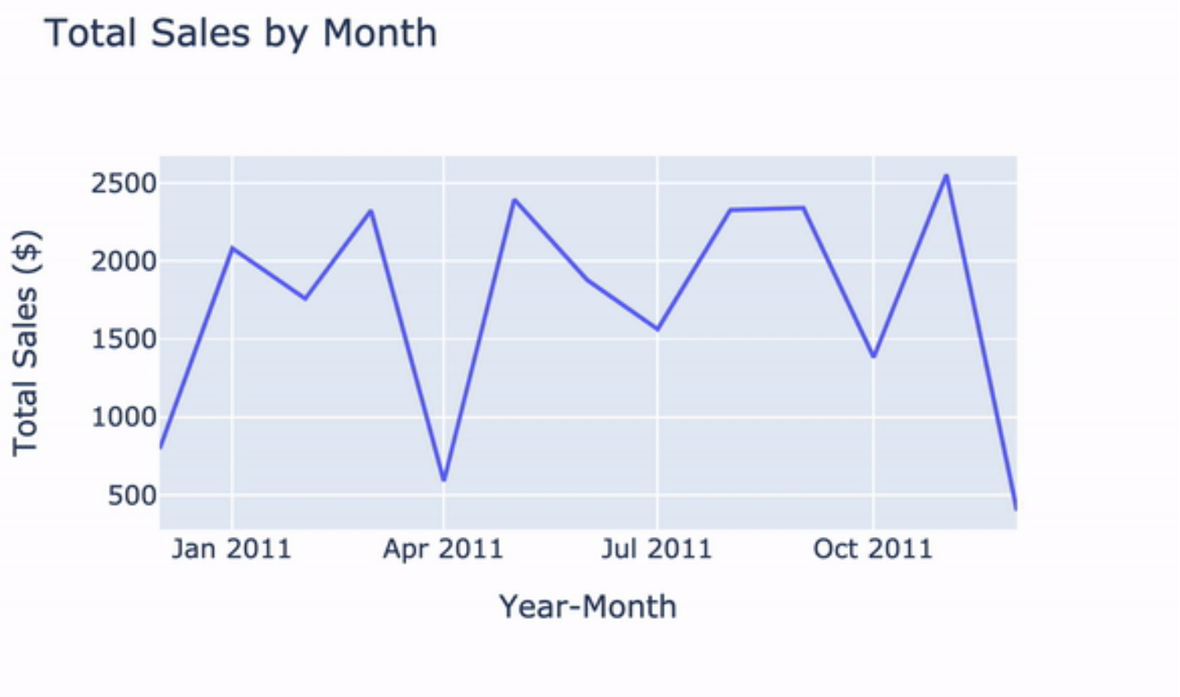
Our e-commerce data

- Dataset of e-commerce sales

- Details:
  - Item category (Major, Minor) + description
  - Unit price, quantity (+ OrderValue)
  - Country
  - Year-Month of sale

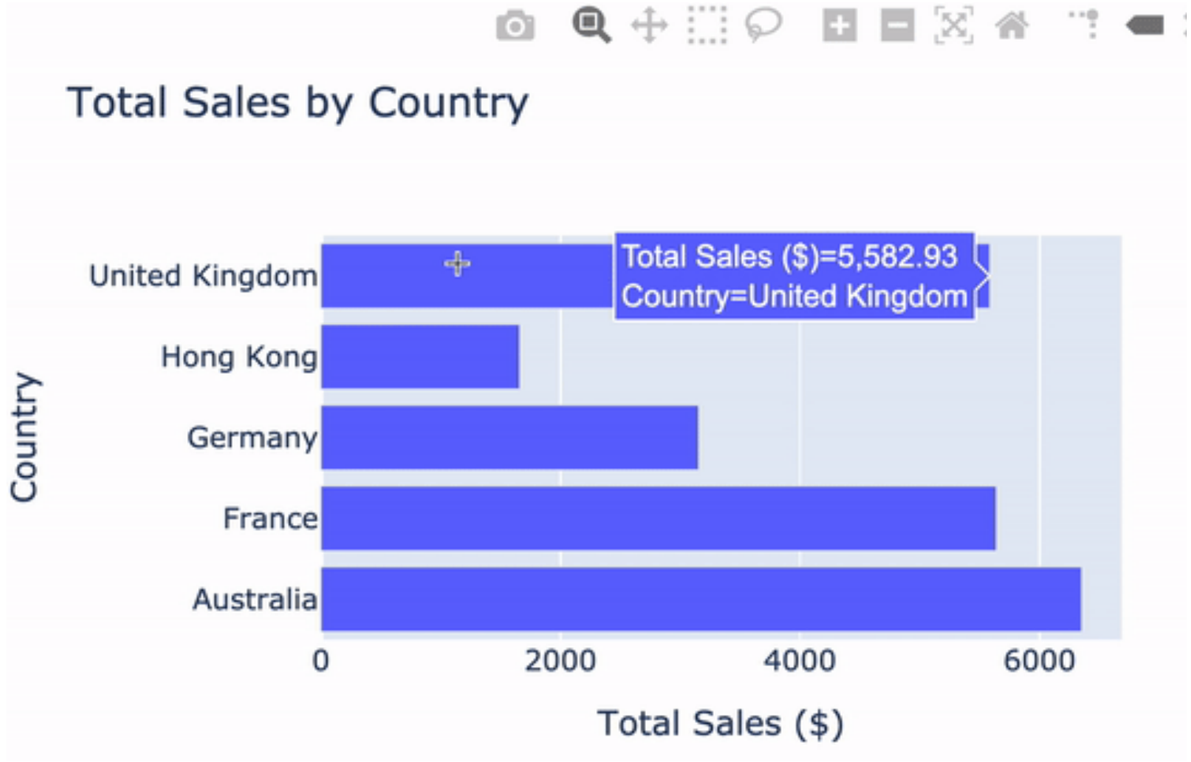
Line charts with plotly.express

```
import plotly.express as px
line_graph = px.line(
  data_frame=ecom_sales,
  x='Year-Month',
  y='Total Sales ($)',
  title='Total Sales by Month')
line_graph.show()
```



Bar charts with plotly.express

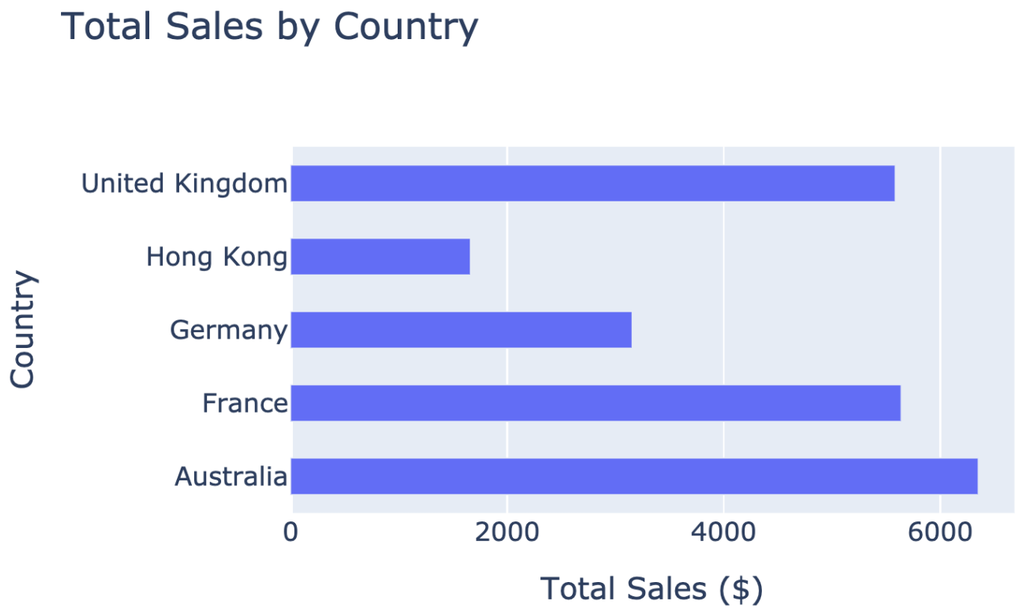
```
bar_fig = px.bar(
  data_frame=ecom_sales,
  x='Total Sales ($)',
  y='Country',
  title='Total Sales by Country',
  orientation='h')
bar_fig.show()
```



Customizing Plotly graphs

Changing the bar width of our bar graph:

```
bar_fig.update_layout({'bargap': 0.5})
bar_fig.show()
```



Check out the **Plotly documentation**

Let's practice!

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From Plotly to Dash

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A first Dash App

A complete Dash app:

```
from dash import Dash, dcc
app = Dash()
app.layout = [dcc.Graph(id='example-graph', figure=bar_fig)]
if __name__ == '__main__':
    app.run(debug=True)
```

- Python functionality possible
  - e.g., String interpolation `print("f{my_variable}")`

The main Dash imports

```
from dash import Dash, dcc
```

- `Dash` initializes the app
- `dcc` has UI components like graphs and inputs
  - One component in our app
  - More components throughout the course

The app layout

```
app = Dash()
app.layout = [dcc.Graph(
  id='example-graph',
  figure=bar_fig)]
```

- Create an app object using `Dash()`
- Set the `app.layout`
  - Using `dcc.Graph()`
    - `figure` = The Plotly figure to render
    - `id` = Important for callbacks later

Running the app

```
if __name__ == '__main__':
    app.run(debug=True)
```

- Script is run from command-line
  - i.e., `python my_app.py` in the command-line
- `debug` for feedback when testing

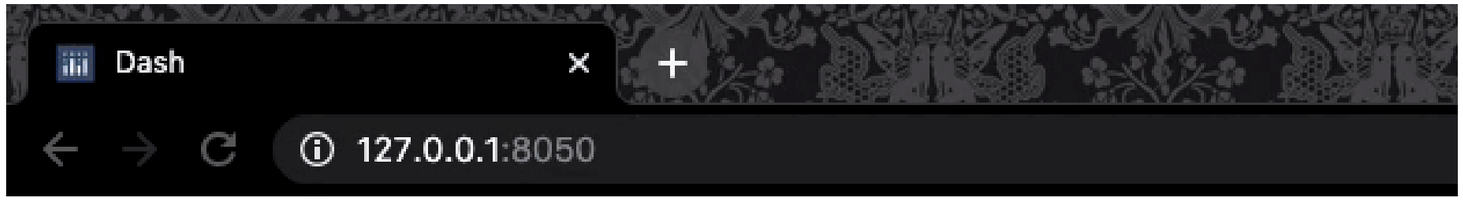
Our app

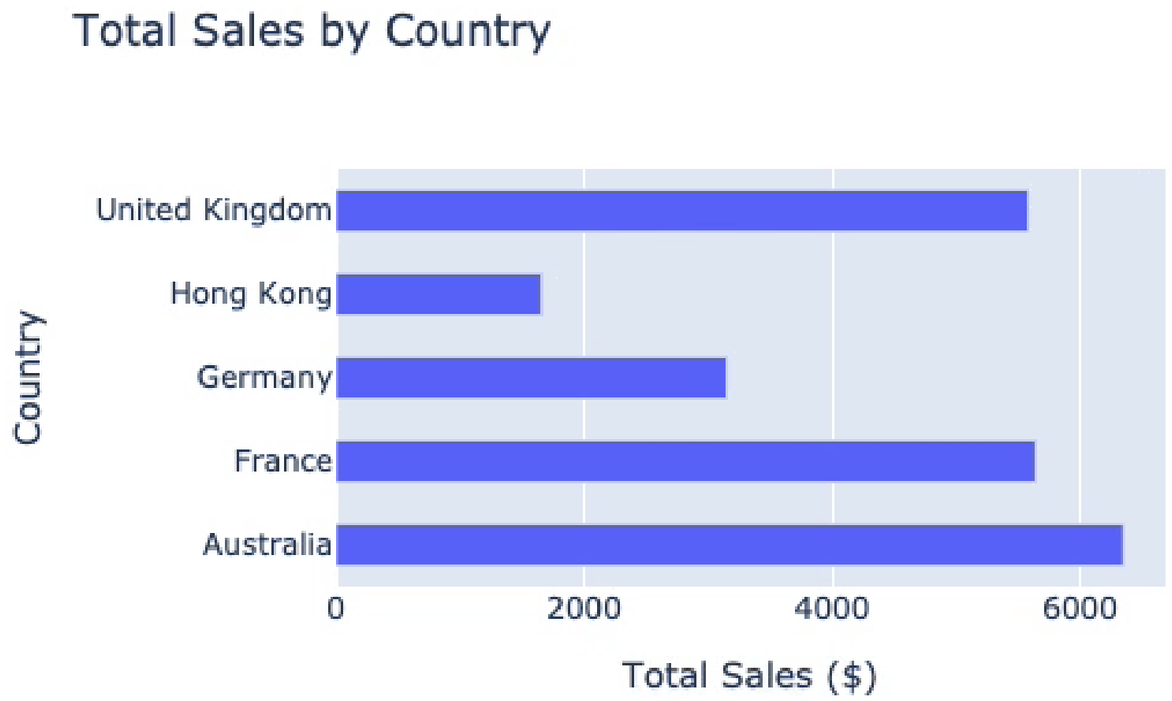
- Access via a web browser such as Google Chrome
- While served, update and save `.py` file to see live updates in browser

```
Dash is running on http://127.0.0.1:8050/

 * Serving Flask app "simple_app" (lazy loading)
 * Environment: production
   WARNING: This is a development server. Do not use it in a production deployment.
   Use a production WSGI server instead.
 * Debug mode: on
```

Our app in the browser





Dash in DataCamp

- Some differences to other DataCamp exercises:
  - Setup lines at the top of the exercises.
  - All executed at once (not line-by-line)
  - (Much) longer code
- Fully-functional dashboards (expand the window to see!)

Let's practice!

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Positioning Dash components

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HTML and the web

HTML: language for structuring websites

- HTML: wooden structure of a house
  - Set placement of objects
- CSS: paint color of a room
  - Style (e.g., background color) of objects

Div and H tags

- Dash uses `dash.html` to interface between HTML and Python

Two important HTML structures ('tags'):

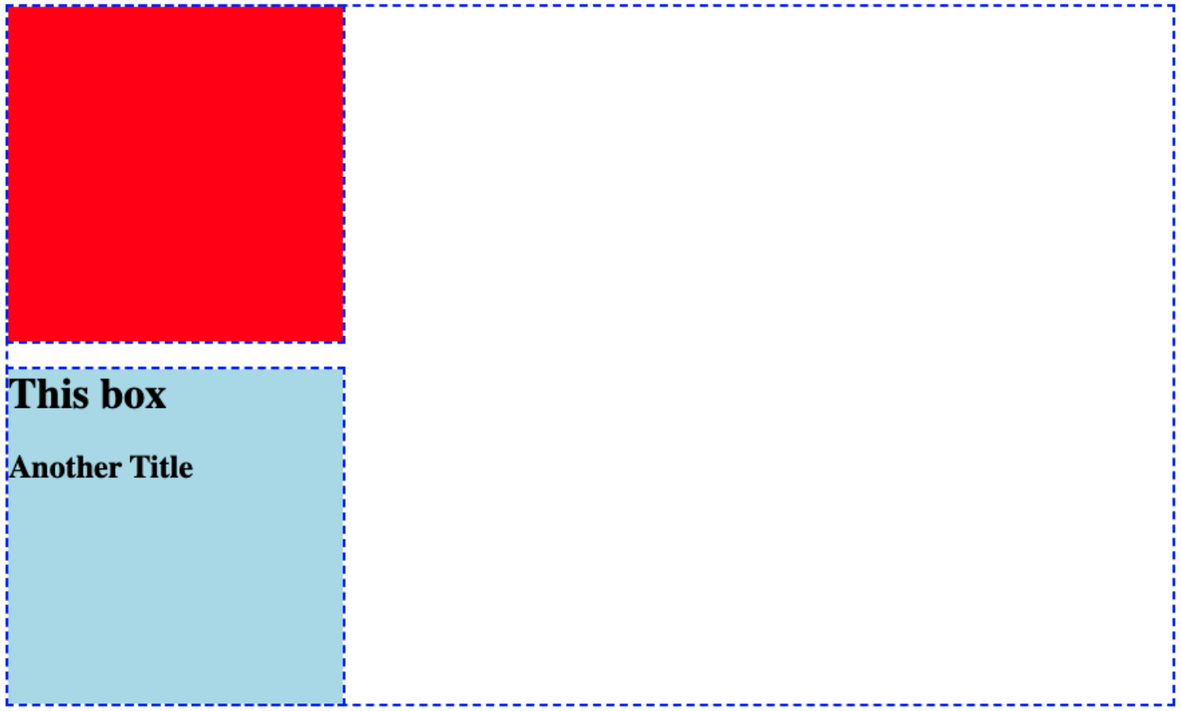
- Div tags: important for structuring websites
  - Can have many different-sized divs with different things inside
- H tags: different sized titles (H1 > H6)

Using Div and H tags

- Overall div (everything inside)
- Div inside: red background
- Div with blue background
  - H tags inside
- Ignore the `style` part - more on 'CSS' later!

```
<div>
  <div style="background-color: red;
              width:250; height:250;">
  </div>
  <div style="background-color: lightblue;
              width:250; height:250;">
    <h1>This box</h1>
    <h2>Another Title</h2>
  </div>
</div>
```

Our example displayed



Take note:

- Red background div
- Blue background div with H tags

Our example in Dash

- Recreating HTML example with Dash

```
from dash import Dash, html
app = Dash()
app.layout = [
    html.Div(style={'height':250, 'width':250, 'background-color':'red'}),
    html.Div(children=[
        html.H1("This box"),
        html.H2("Another Title")],
        style={'background-color':'lightblue'})
    ]
```

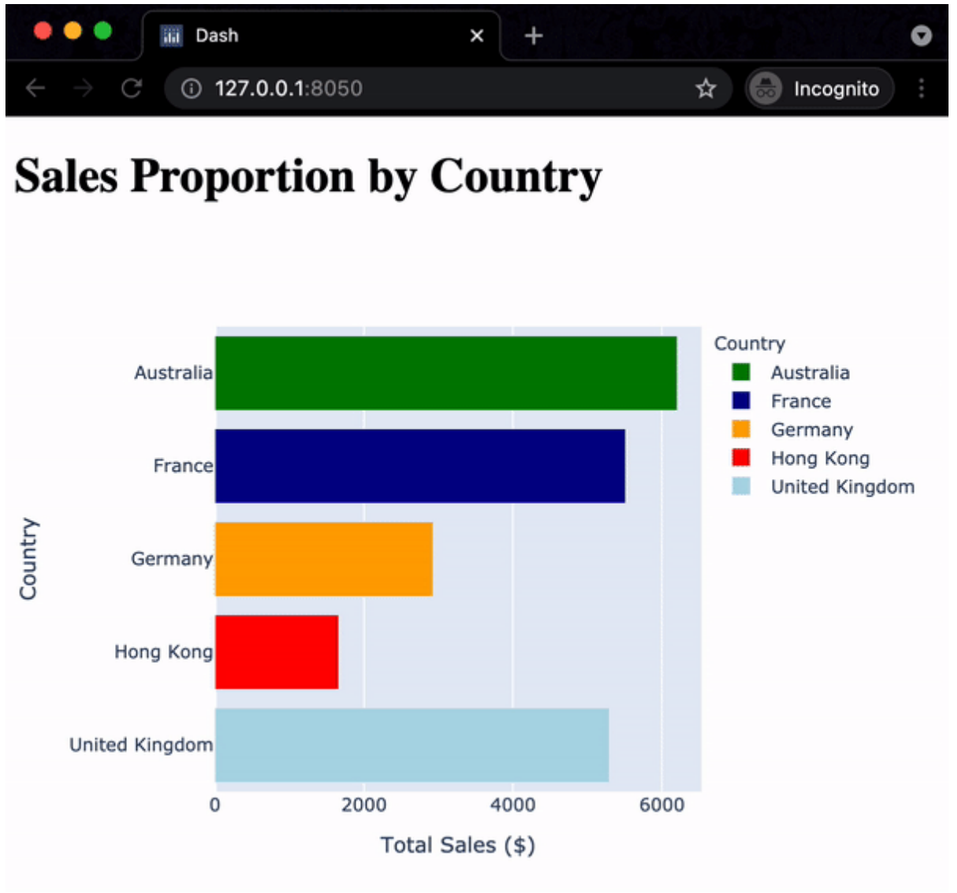
Breaking down the layout

- HTML tags align to Dash `html.()`
  - `html.Div()` = `<div>`
  - `html.H1()` = `<h1>`
- The last div has a `children` argument
  - A list of objects to go inside
- We can put `dcc.Graph()` components inside too!

```
from dash import Dash, html
app.layout = [
  html.Div(
    style={'background-color':'red',
           'height':250, 'width':250}),
  html.Div(
  children=[
      html.H1("This box"),
      html.H2("Another Title")]
    ,style={'background-color':'lightblue',
              'height':250, 'width':250})
]
```

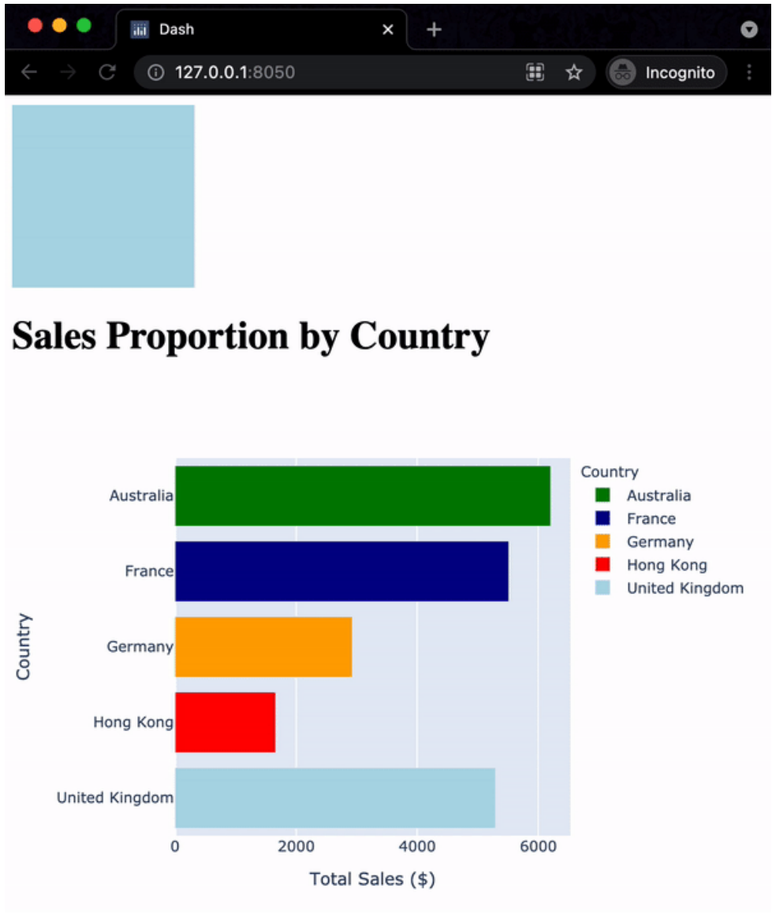
Graphs in the layout

```
bar_fig_country = px.bar(ecom_sales,
 x='Total Sales ($)', y='Country',
 color='Country', color_discrete_map=
 {'United Kingdom':'lightblue',
 'Germany':'orange', 'France':'darkblue',
 'Australia':'green', 'Hong Kong':'red'})
app = Dash()
app.layout = [
  html.H1("Sales Proportion by Country"),
  dcc.Graph(id='bar_graph',
            figure=bar_fig_country)
]
```



Adding more structure

```
app.layout = [
  html.Div(style={
    'width':150,'height':150,
    'background-color':'lightblue'}),
  html.H1("Sales Proportion by Country"),
  dcc.Graph(id='bar_graph',
            figure=bar_fig_country)
]
```



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