introduction to data visualization

Pre-hack session tools tutorial, and overview

Bryan Scott - Data Science Fellowship Program Session 17 - Texas A&M - March 2, 2023

Python visualization libraries

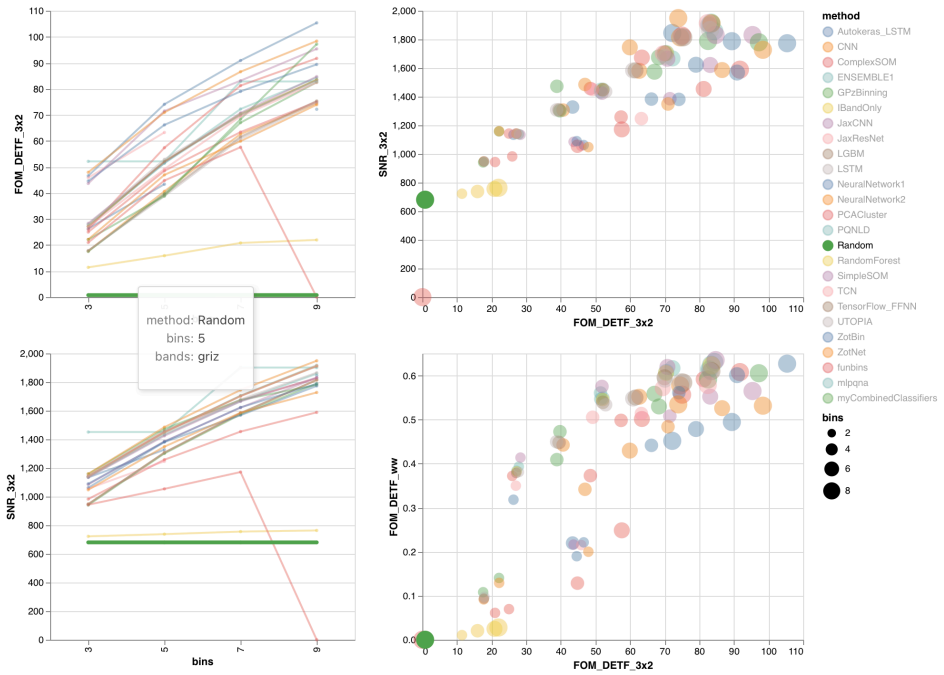
going beyond matplotlib…

Contemporary visualization is based on the web

d3.js

d3.js visualizations for Rubin/LSST science

visualizing CosmoDC2 results



Plotly

Graph Objects

```
Figure({
    'data': [{'hovertemplate': 'x=%{x}<br>y=%{y}<extra></extra>',
              'legendgroup': '',
              'line': {'color': '#636efa', 'dash': 'solid'},
              'marker': {'symbol': 'circle'},
              'mode': 'lines',
              'name': '',
              'orientation': 'v',
              'showlegend': False,
              'type': 'scatter',
              'x': array(['a', 'b', 'c'], dtype=object),
              'xaxis': 'x',
              'y': array([1, 3, 2]),
              'yaxis': 'y'}],
    'layout': {'legend': {'tracegroupgap': 0},
               'template': '...',
               'title': {'text': 'sample figure'},
               'xaxis': {'anchor': 'y', 'domain': [0.0, 1.0], 'title': {'text': 'x'}},
               'yaxis': {'anchor': 'x', 'domain': [0.0, 1.0], 'title': {'text': 'y'}}}
})
```

Plotly

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               'yaxis': {'anchor': 'x', 'domain': [0.0, 1.0], 'title': {'text': 'y'}}}
})
```

Trace

Plotly

Graph Objects

```
Figure({
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              'legendgroup': '',
              'line': {'color': '#636efa', 'dash': 'solid'},
              'marker': {'symbol': 'circle'},
              'mode': 'lines',
              'name': '',
              'orientation': 'v',
              'showlegend': False,
              'type': 'scatter',
              'x': array(['a', 'b', 'c'], dtype=object),
              'xaxis': 'x',
              'y': array([1, 3, 2]),
              'yaxis': 'y'}],
    'layout': {'legend': {'tracegroupgap': 0},
               'template': '...',
               'title': {'text': 'sample figure'},
               'xaxis': {'anchor': 'y', 'domain': [0.0, 1.0], 'title': {'text': 'x'}},
               'yaxis': {'anchor': 'x', 'domain': [0.0, 1.0], 'title': {'text': 'y'}}}
})
```

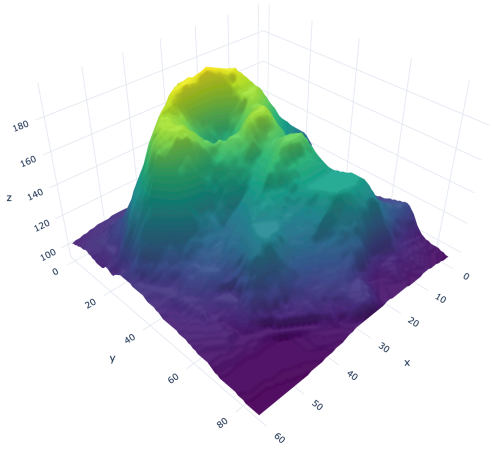
Plotly

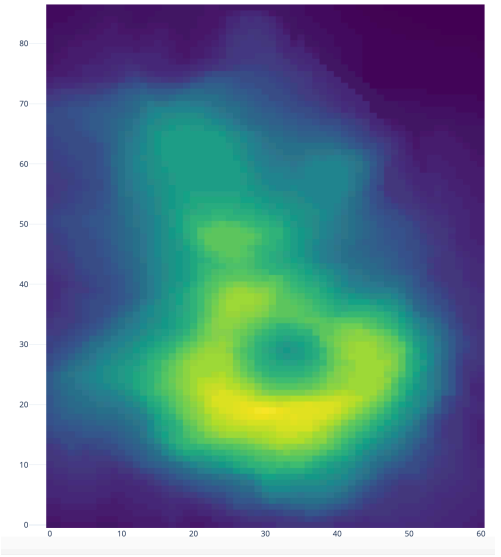
Menus and Buttons

"restyle": modify **data** or data attributes

"relayout": modify **layout** attributes

"update": modify **data and layout** attributes;
combination of "restyle" and "relayout"





Plotly

Menus and Buttons

"restyle": modify **data** or data attributes

"relayout": modify **layout** attributes

"update": modify **data and layout** attributes; combination of "restyle" and "relayout"

```
# Add dropdown
fig.update_layout(
    updatemenus=[
        dict(
            type = "buttons",
            direction = "left",
            buttons=list([
                dict(
                    args=["type", "surface"],
                    label="3D Surface",
                    method="restyle"
                ),
                dict(
                    args=["type", "heatmap"],
                    label="Heatmap",
                    method="restyle"
                )
            ]),
            pad={"r": 10, "t": 10},
            showactive=True,
            x=0.11,
            xanchor="left",
            y=1.1,
            yanchor="top"
        ),
    ]
)
```

In the Day 4/5 repository, find the introduction to plotly tutorial notebook.

This will walk through interactive visualization using plotly.

As you work through the notebook, think about how to employ these tools to enable informative, beautiful, and *insightful* visualizations for your hack day project.