Python visualization libraries

going beyond matplotlib…

Contemporary visualization is based on the web

d3.js
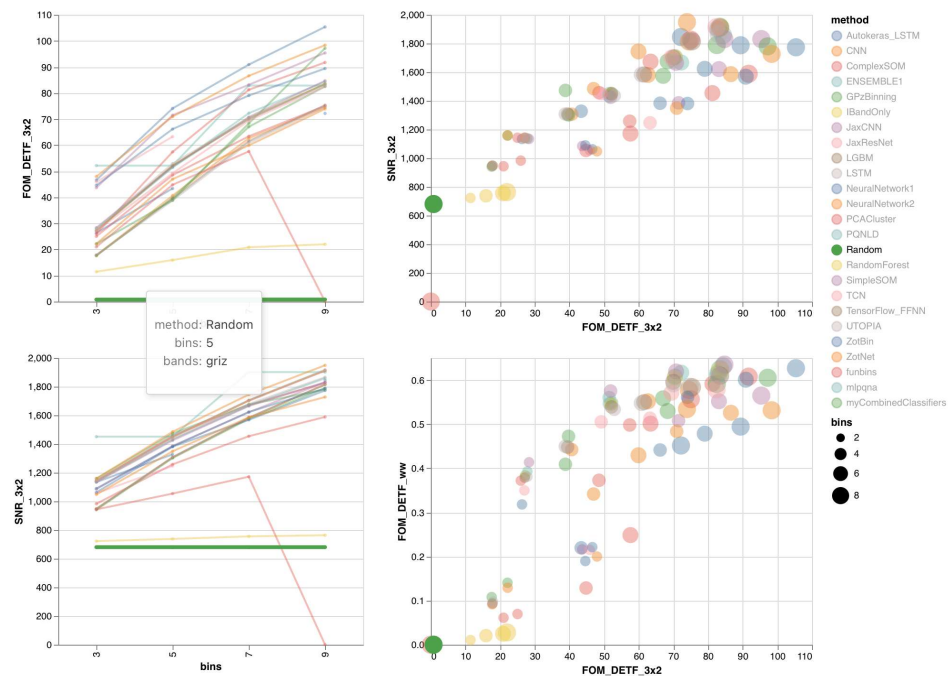
d3.js visualizations for Rubin/LSST science
visualizing CosmoDC2 results

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

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'}}}
})
```

Trace

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'}}}
})
```

←————————————————————————————— "Trace"

←————————————————————————————— Positioning

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"