Advanced Python3: Object-oriented programming, databases and visualisation

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L03: Advanced Visualisation

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Visualisation packages in Python

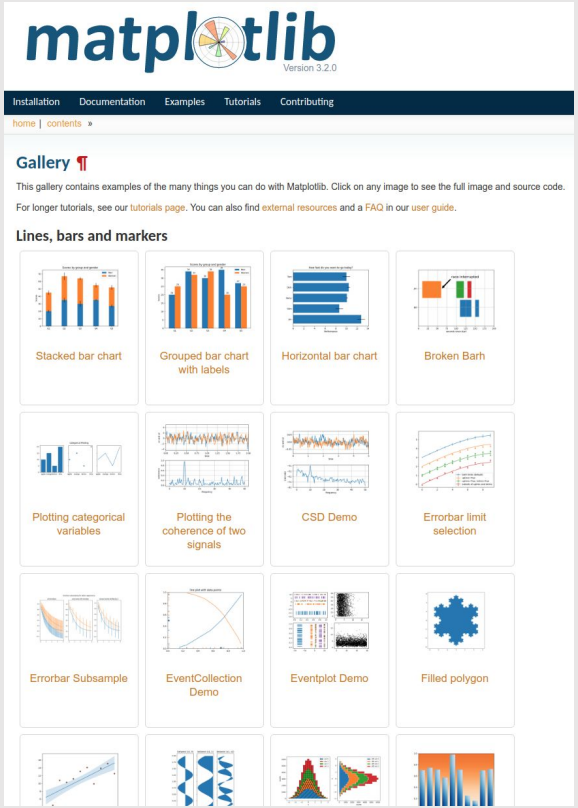
Matplotlib: Arguably the best known and most widely used visualisation package. It creates static figures and is best used for print graphs.

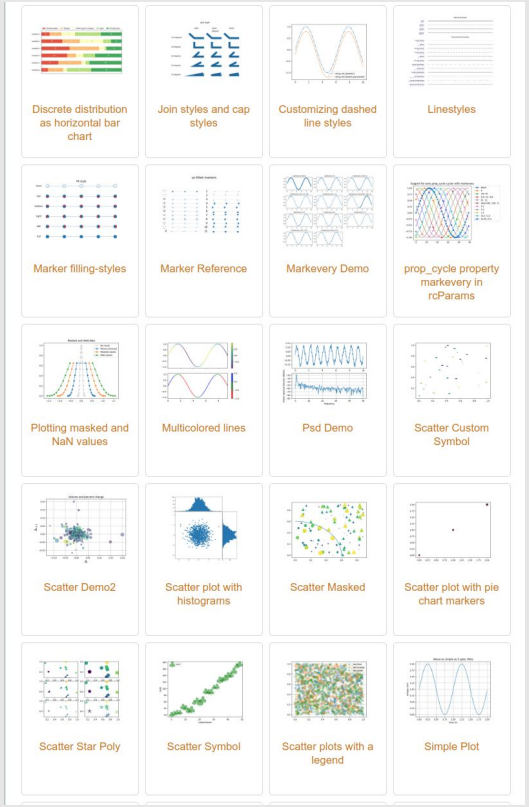
Pro:
- lightweight, but very versatile
- basic plots are extremely easy to implement
- simple customisation makes visually appealing, publication-ready figures
- Matplotlib Gallery (https://matplotlib.org/3.1.3/gallery/index.html) has example code for probably every kind of plot you'll ever need

Con:
- code to customise plots can get very complex quickly
- plots are static 2D raster graphics

> *"Matplotlib is mainly deployed for basic plotting."*
> *— Matplotlib*

Visualisation packages in Python





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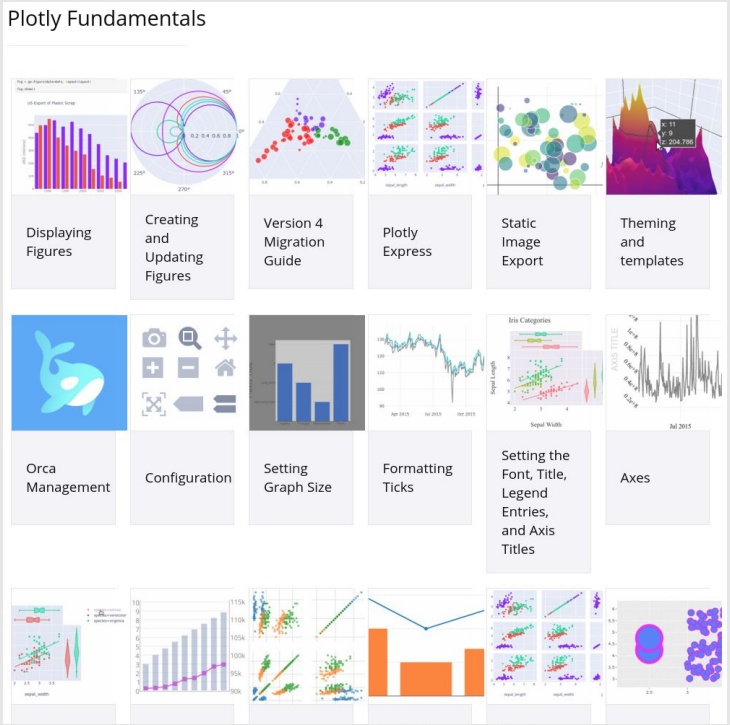
Visualisation packages in Python

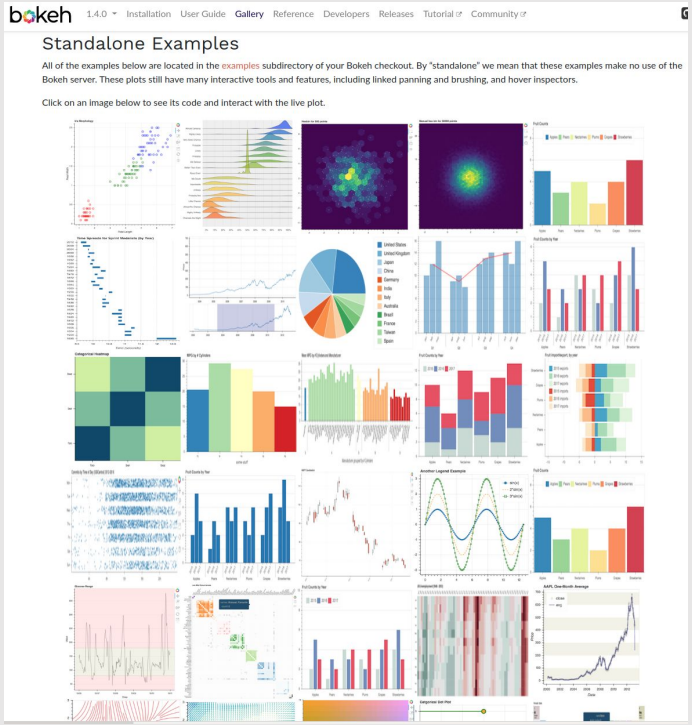
When analysing large datasets it becomes more desirable to be able to interact with your graphs directly, instead of having to plot a new raster graphic for every change. This is where Plotly and Bokeh come in.

Plotly: JavaScript-based library for interactive visualisation of datasets, integrates with pandas natively. While the Python interface to Plotly is open-source, their dashboard and browser-integration tools are not.

Bokeh: Browser-based library for interactive visualisation on dashboards. Less interactive than Plotly, but better at creating Matplotlib-style plots and completely open-source.

Visualisation packages in Python





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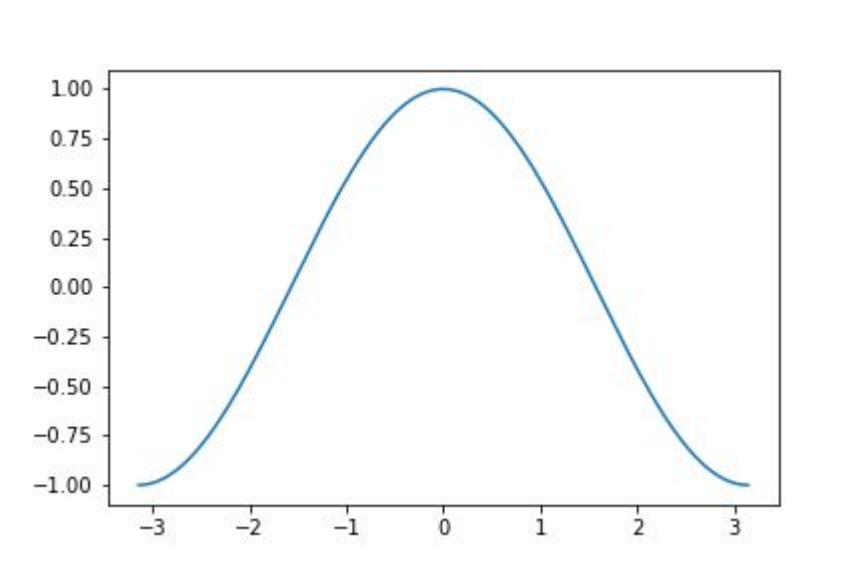
Basic plotting with Matplotlib

```
# plot.py

import matplotlib.pyplot as plt
import numpy as np

x = np.linspace(-np.pi, np.pi, 256)
y = np.cos(x)

plt.plot(x, y)
plt.show()
```



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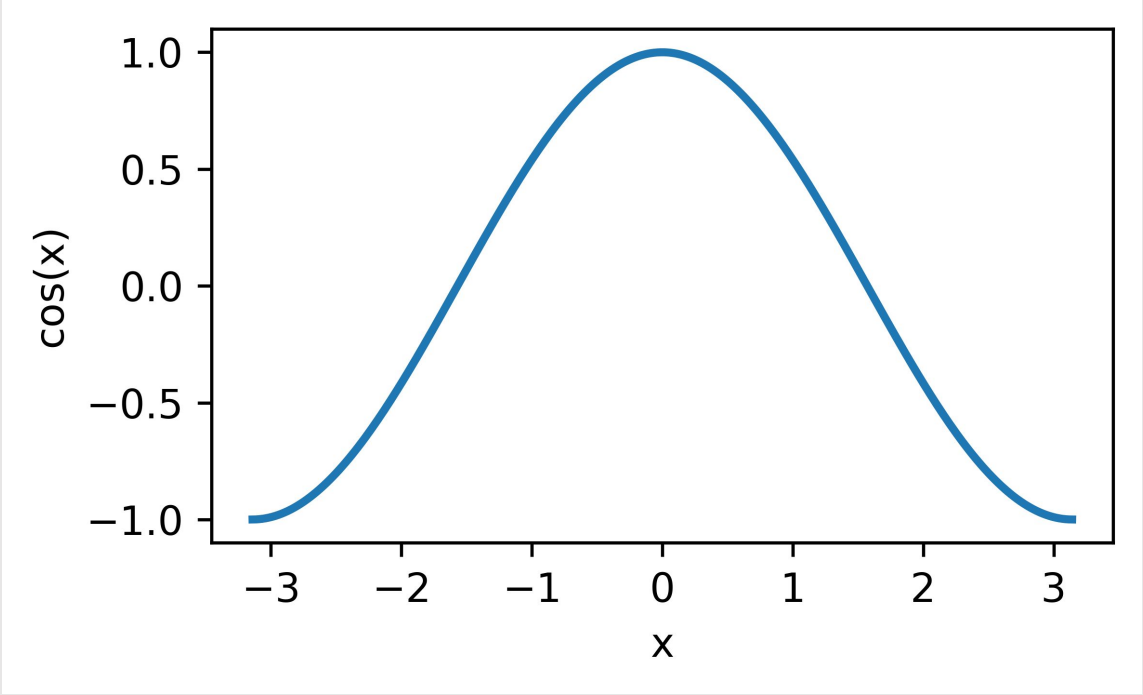
Basic plotting with Matplotlib

```
# plot.py

import matplotlib.pyplot as plt
import numpy as np

x = np.linspace(-np.pi, np.pi, 256)
y = np.cos(x)

golden = 1.618
h = 2; w = h*golden
fig = plt.figure(figsize=(w,h),
dpi=600)

plt.plot(x, y, lw=2)
plt.xlabel("x")
plt.ylabel("cos(x)")

fig.tight_layout()
plt.show()
```



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Basic plotting with Plotly

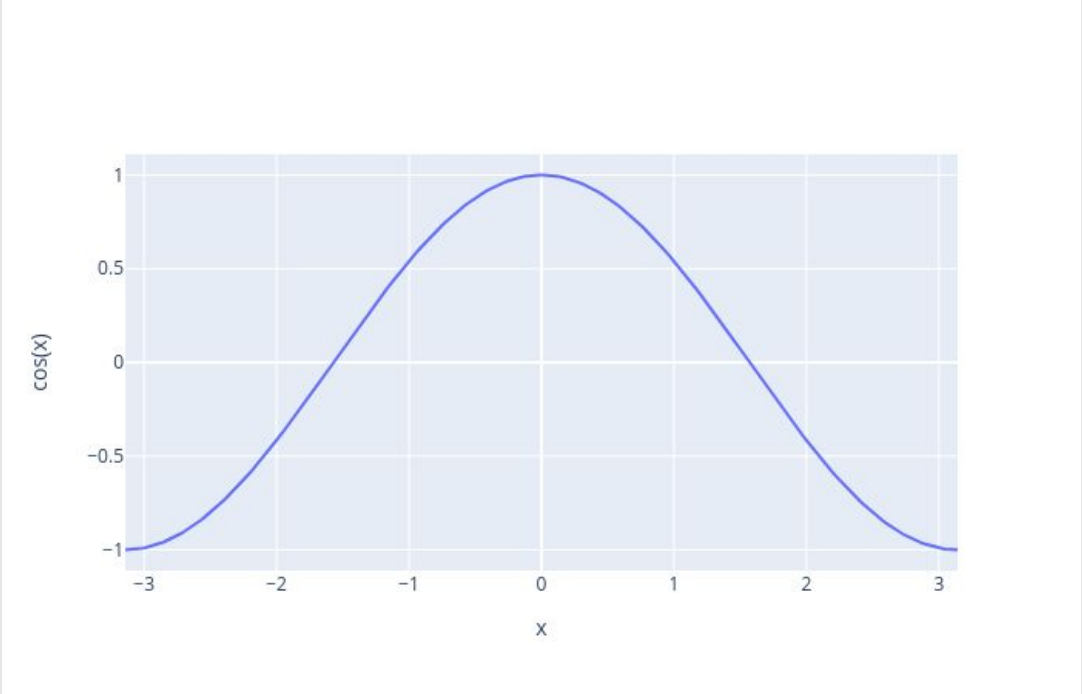
```
# plot.py

import plotly.graph_objects as go
import numpy as np

x = np.linspace(-np.pi, np.pi, 256)
y = np.cos(x)

fig = go.Figure()
fig.add_trace(go.Scatter(x=x, y=y,
mode='lines'))

fig.update_layout(xaxis_title='x',
yaxis_title='cos(x)')
fig.show()
```



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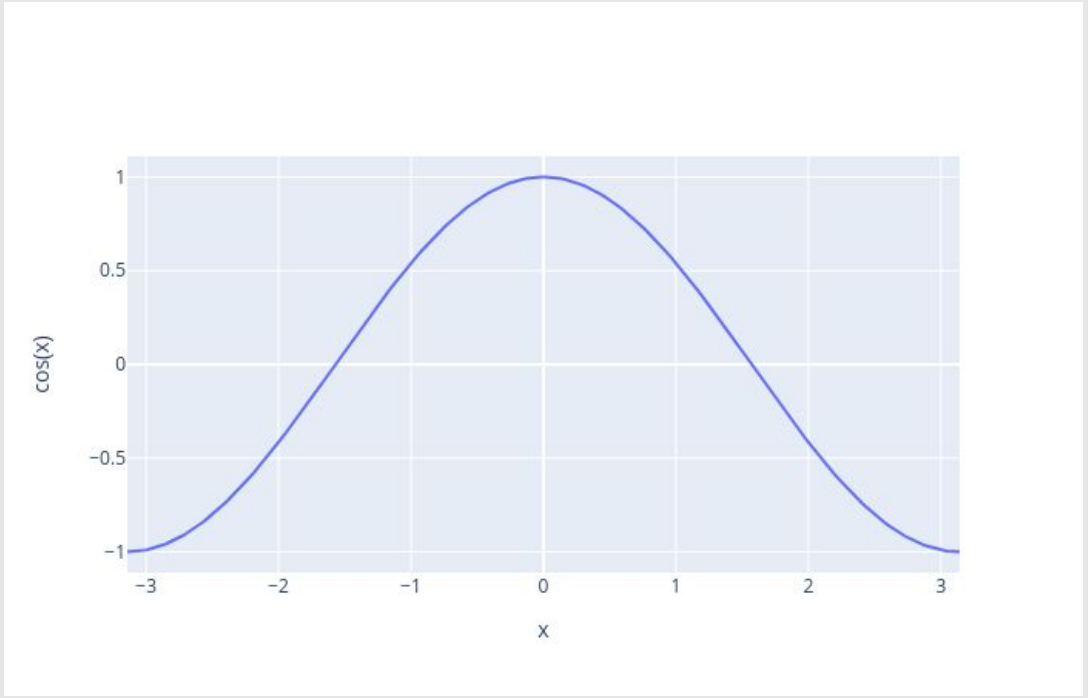
Basic plotting with Plotly

```
# plot.py

...

fig.update_layout(xaxis=dict(
    title="x",
    linecolor='rgb(204, 204, 204)',
    linewidth=2,
    ticks='outside',
  ),
  yaxis=dict(
    title="cos(x)",
    linecolor='rgb(204, 204, 204)',
    linewidth=2,
    ticks='outside',
  ),
  autosize=False,
  plot_bgcolor='white',
)
```



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Basic plotting with Bokeh

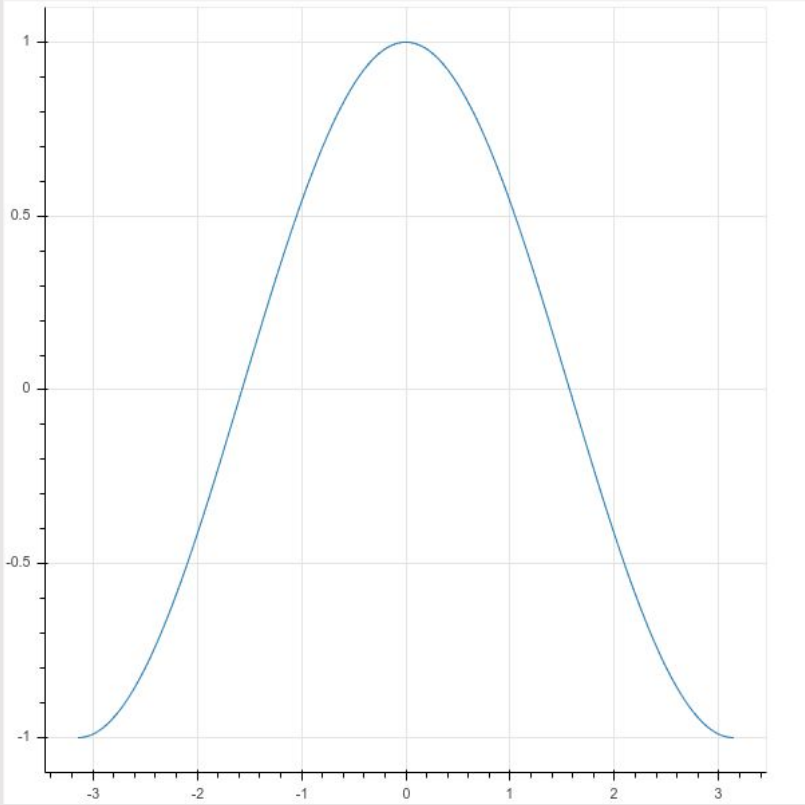
```
# plot.py

from bokeh.plotting import figure,
output_file, show

output_file("basic_bokeh.html")

p = figure()
p.line(x, y)

show(p)
```



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Basic plotting with Bokeh

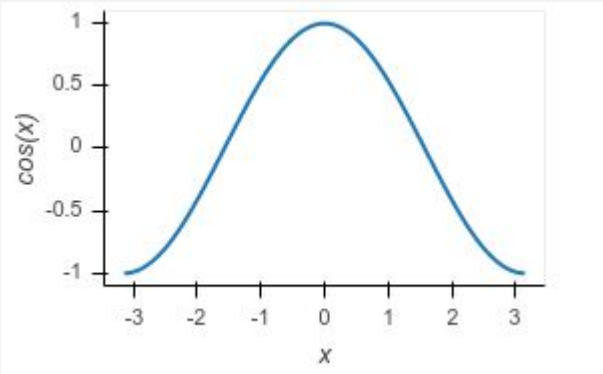
```
# plot.py

golden = 1.618
dpi = 75
h = int(2.5*dpi); w = int(h*golden)

p = figure(plot_width=w,
plot_height=h)
p.line(x, y, line_width=2)

p.xaxis.axis_label = "x"
p.yaxis.axis_label = "cos(x)”
p.xgrid.grid_line_color = None
p.ygrid.grid_line_color = None
p.xaxis.minor_tick_line_color = None
p.yaxis.minor_tick_line_color = None

show(p)
```



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Demo: Dataset visualisations in Plotly and Bokeh