

Data Visualization and Visual Analytics Plotly

Study Program Data Science
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Lecture Roadmap

Data Domains

Comparing Categories | Relationships | Geospatial | Time |
Part-to-whole | Distributions | Uncertainty | ...

Storytelling

Perception +
Visualization Design

Python + Tools

Interactive
Visualization

Why is Plotly a good choice?

Plotly is a good choice for both Exploration and Explanation:

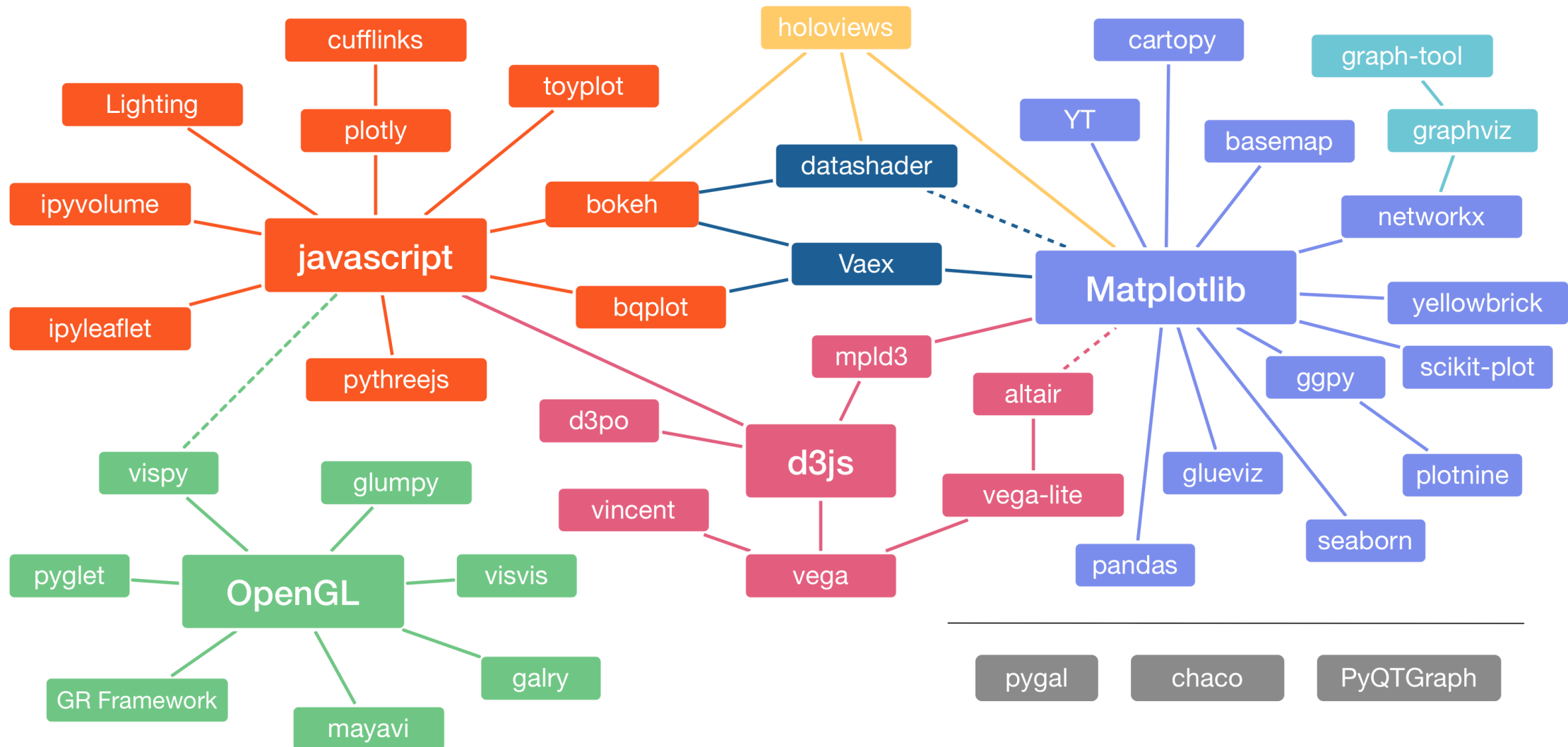
Exploration

- ▶ Typical plots can be created fast via Plotly Express (high-level API)
- ▶ Interactive by default

Explanation

- ▶ Highly customizable via Plotly Graph Objects (low-level API)
- ▶ Can be exported to static formats for publishing (svg, pdf, png, ...) and to interactive formats for web publishing (html, Plotly Dash)

But there are certainly alternatives ...



We can use Plotly in 3 different ways

1. Plotly Express

- ▶ Many common plots and fast prototyping
- ▶ Accepts Pandas DataFrames
- ▶ Automatically handles layout and trace creation for typical scenarios
- ▶ Interoperable with Plotly Graph Objects for further customization

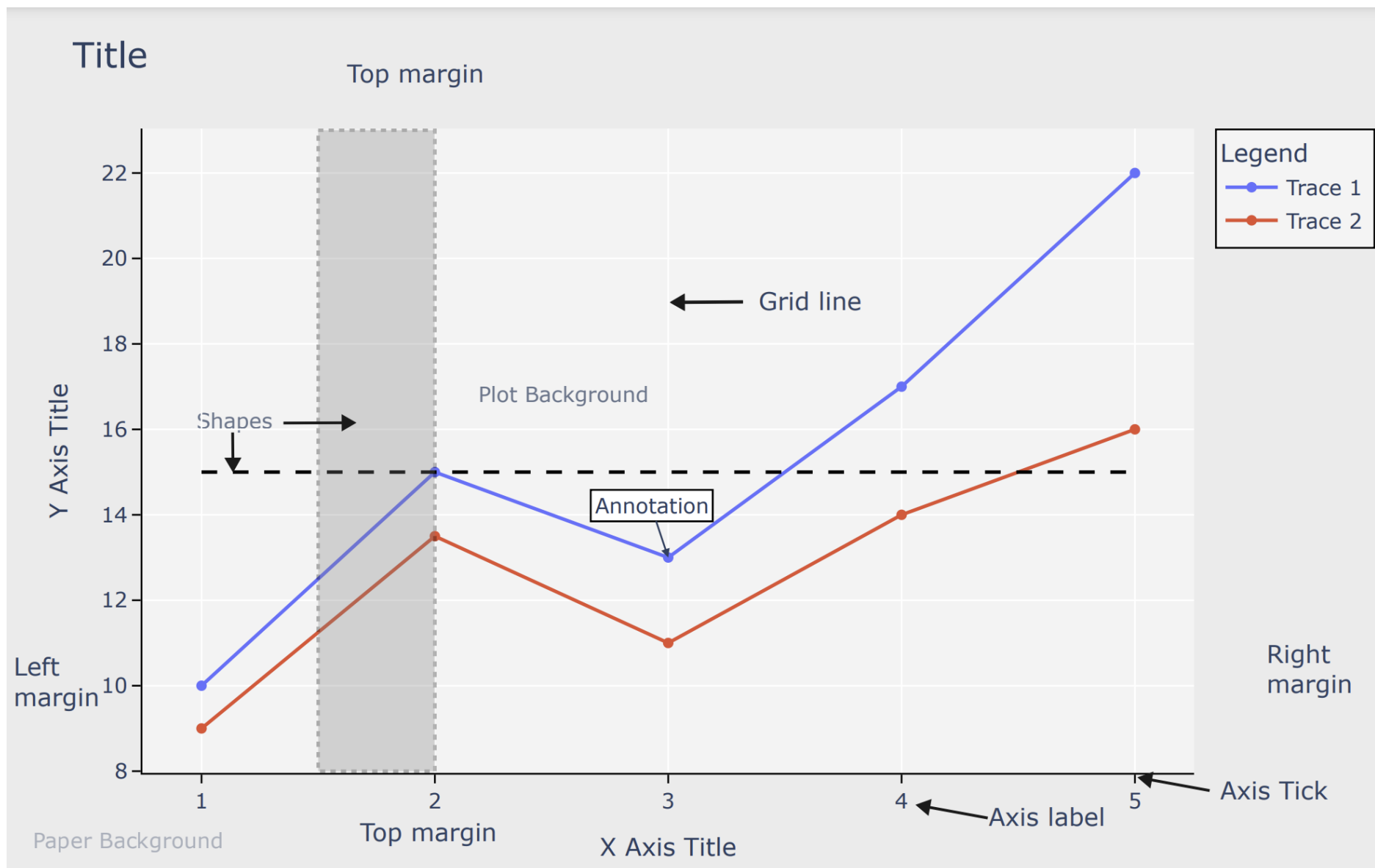
2. Plotly Graph Objects

- ▶ Highest level of flexibility and customization

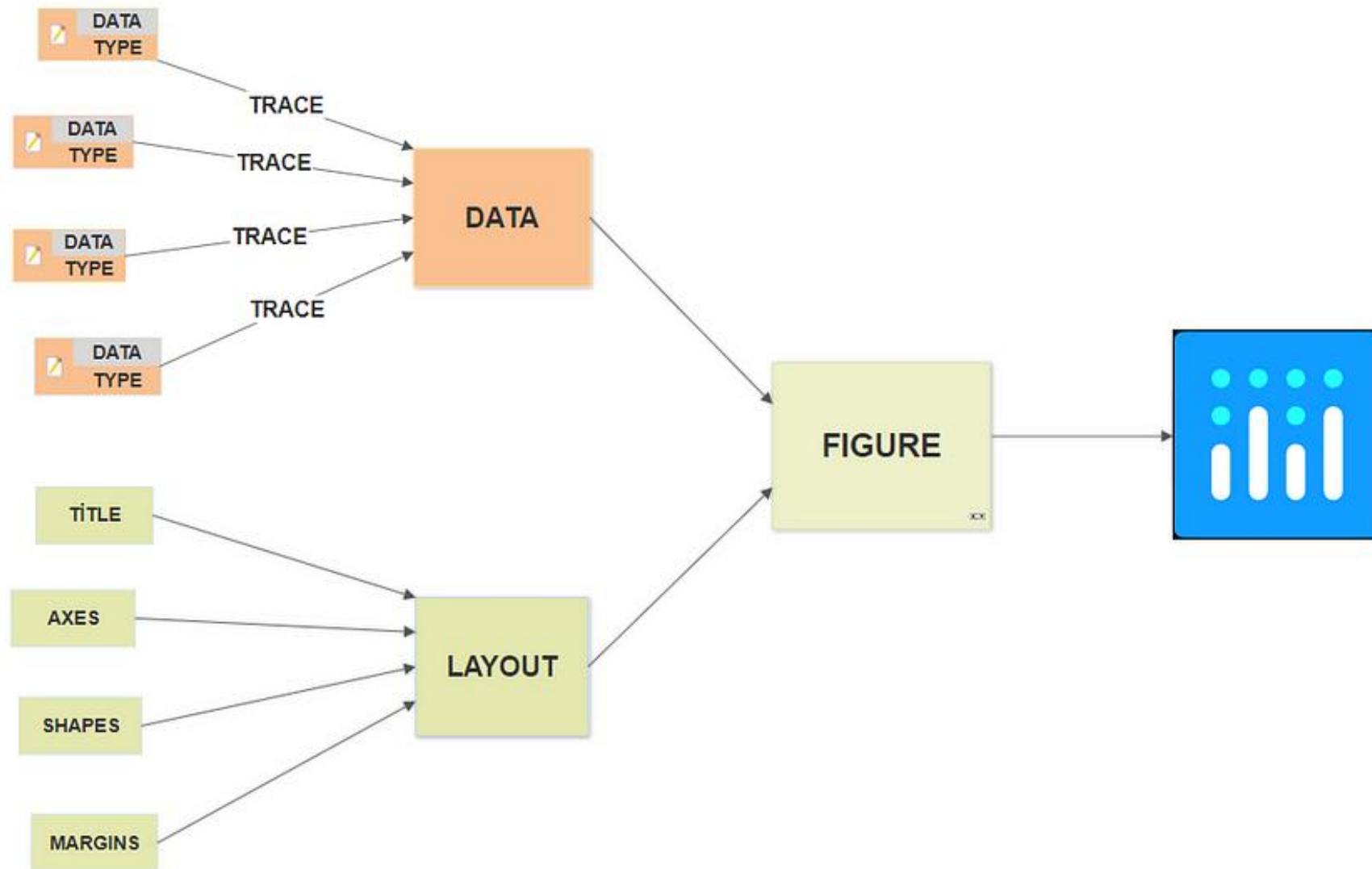
3. Plotly as a Pandas Backend

- ▶ By default, Pandas plot method uses Matplotlib
- ▶ We can override this behavior, such that Pandas Plots uses Plotly

Anatomy of a Plotly Figure



The Plotly Figure



Plotly's figure is composed of 3 attributes

data: a list of data traces each of which consists of

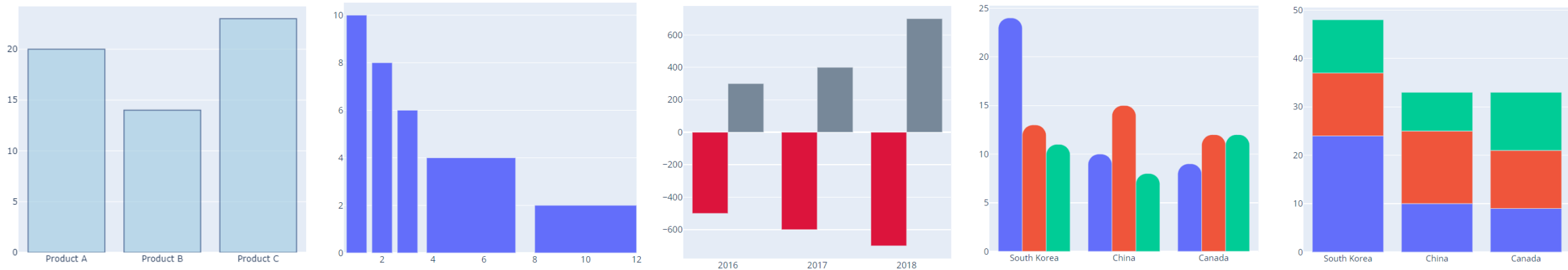
- ▶ type: scatter, bar, pie, heatmap, etc.
- ▶ data: x values, y values, ...
- ▶ attributes defining style (marker color, size, ...) and interactive behavior (tooltip)

layout: dictionary controlling the non-data components

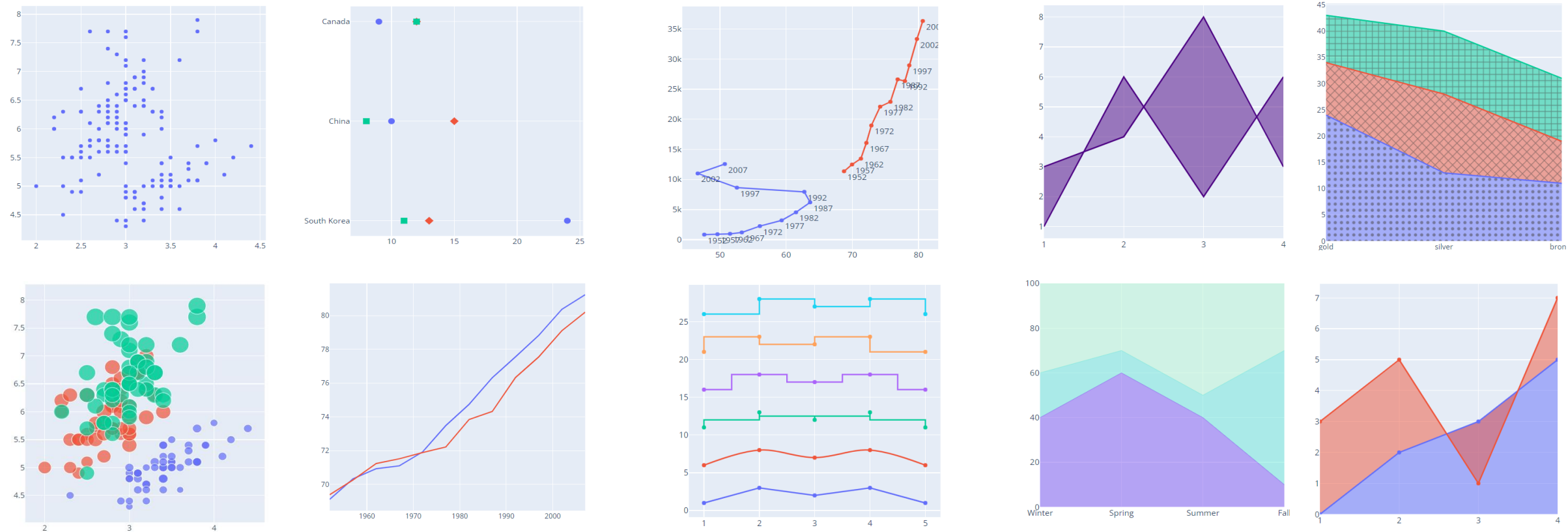
- ▶ Title
- ▶ Width and height
- ▶ Axes configuration
- ▶ ...

frames : used for animations to transition between different data states

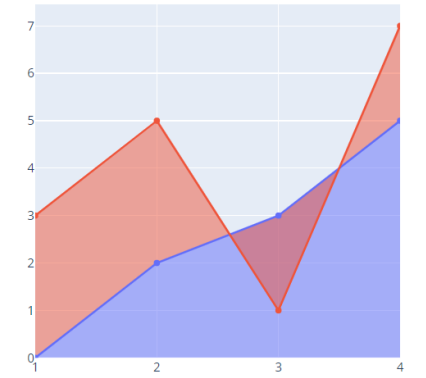
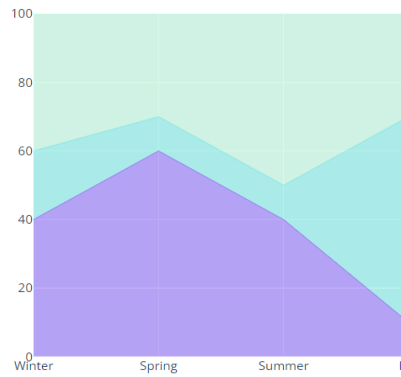
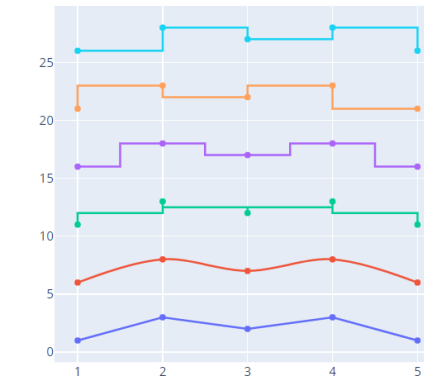
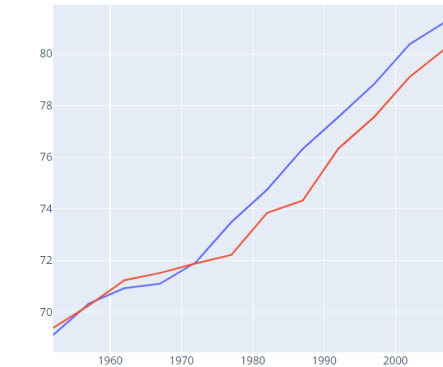
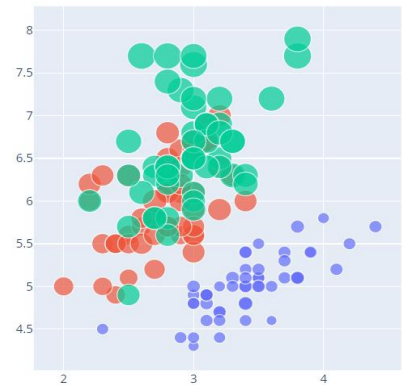
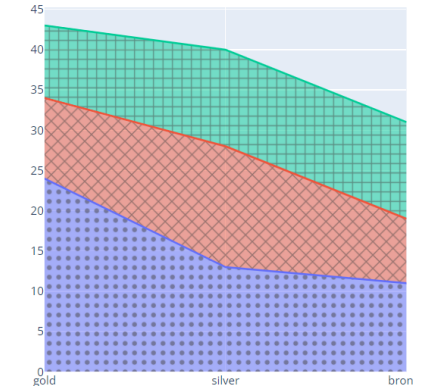
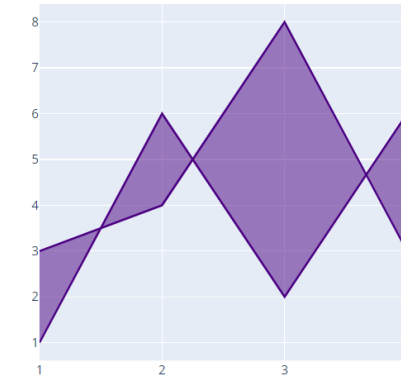
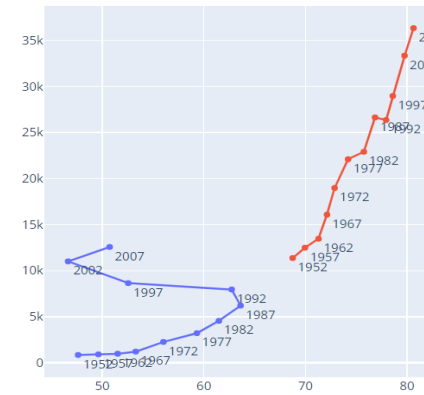
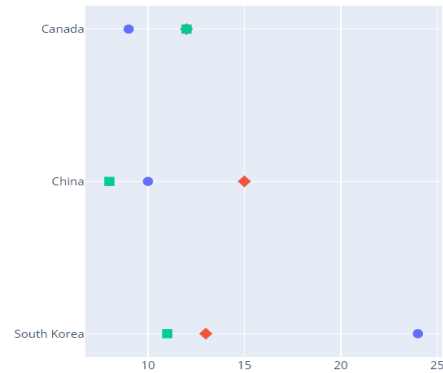
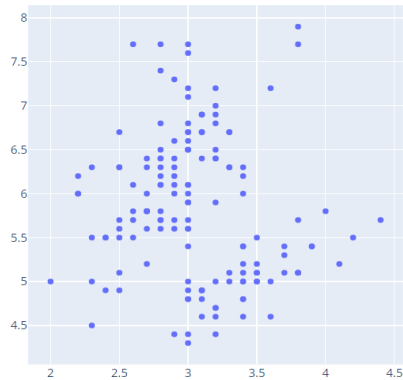
Trace Type: Bar



Trace Type: Scatter



Trace Type: Scatter



Note: **Line and area charts** are also based on the Scatter trace

Plotly Documentation

- ▶ **Main documentation:** <https://plotly.com/python/>
- ▶ **Graph objects API reference:** https://plotly.com/python-api-reference/plotly.graph_objects.html