

# 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:

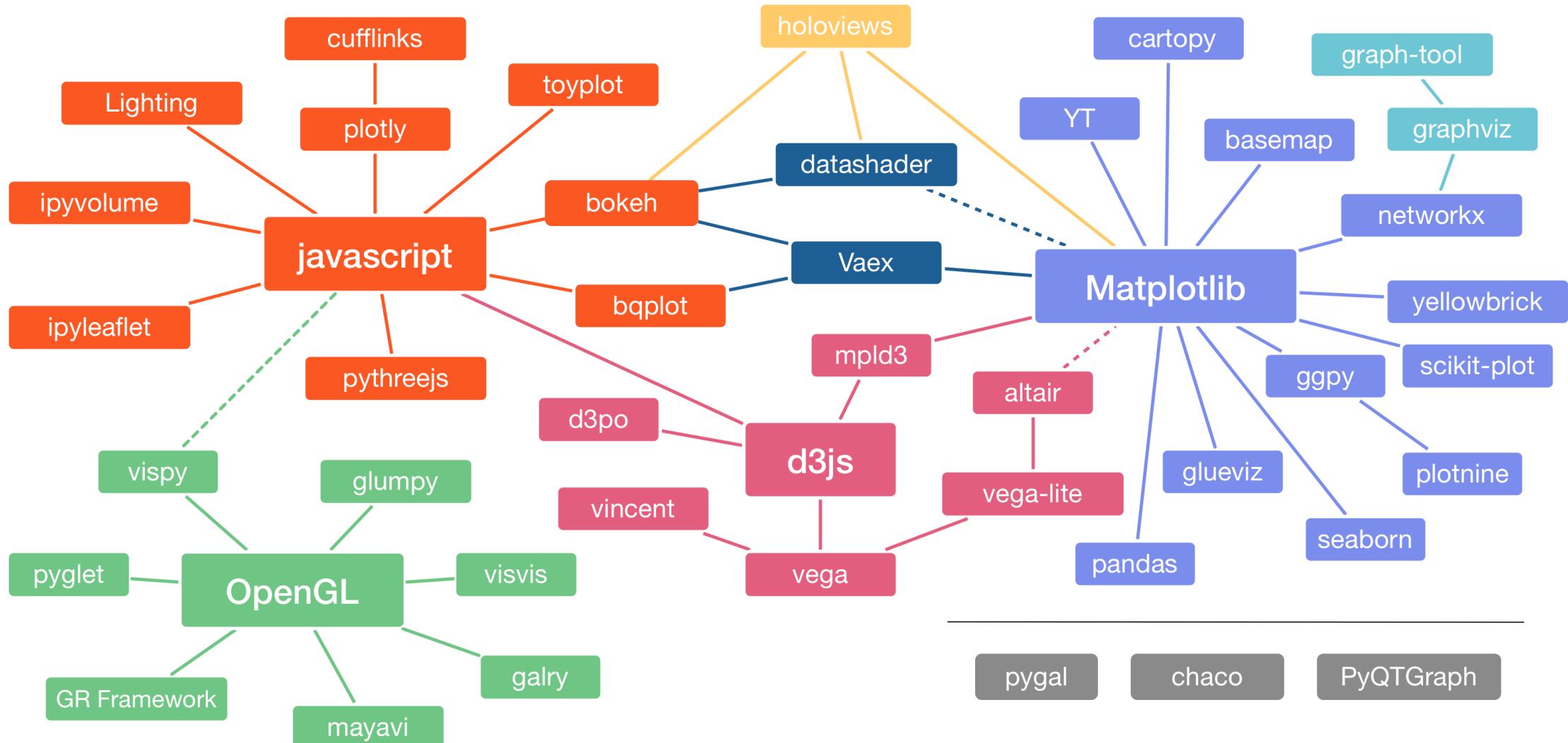
## **Exploration**

- ▶ 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

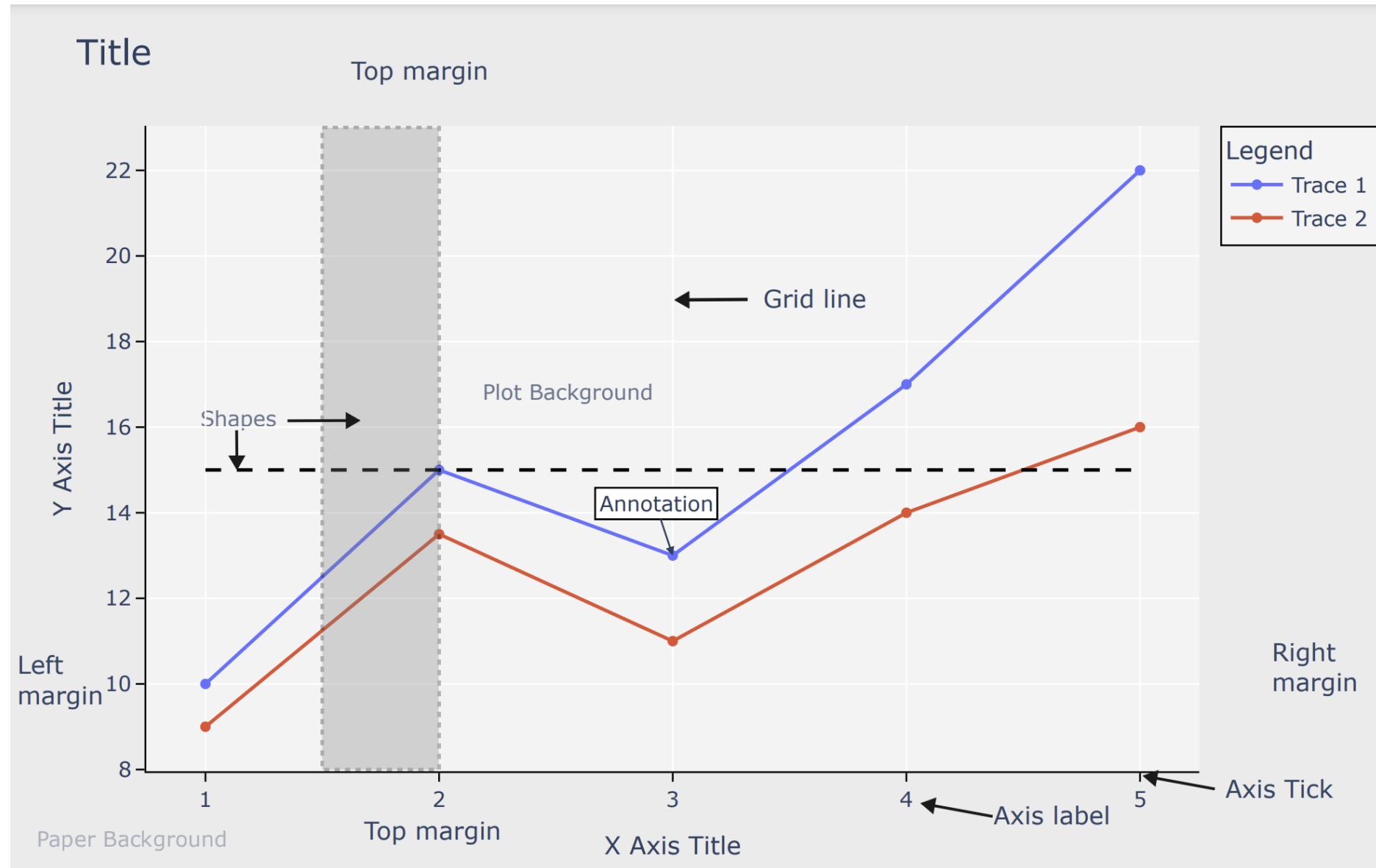
## 2. Plotly Graph Objects

- ▶ Highest level of flexibility and customization

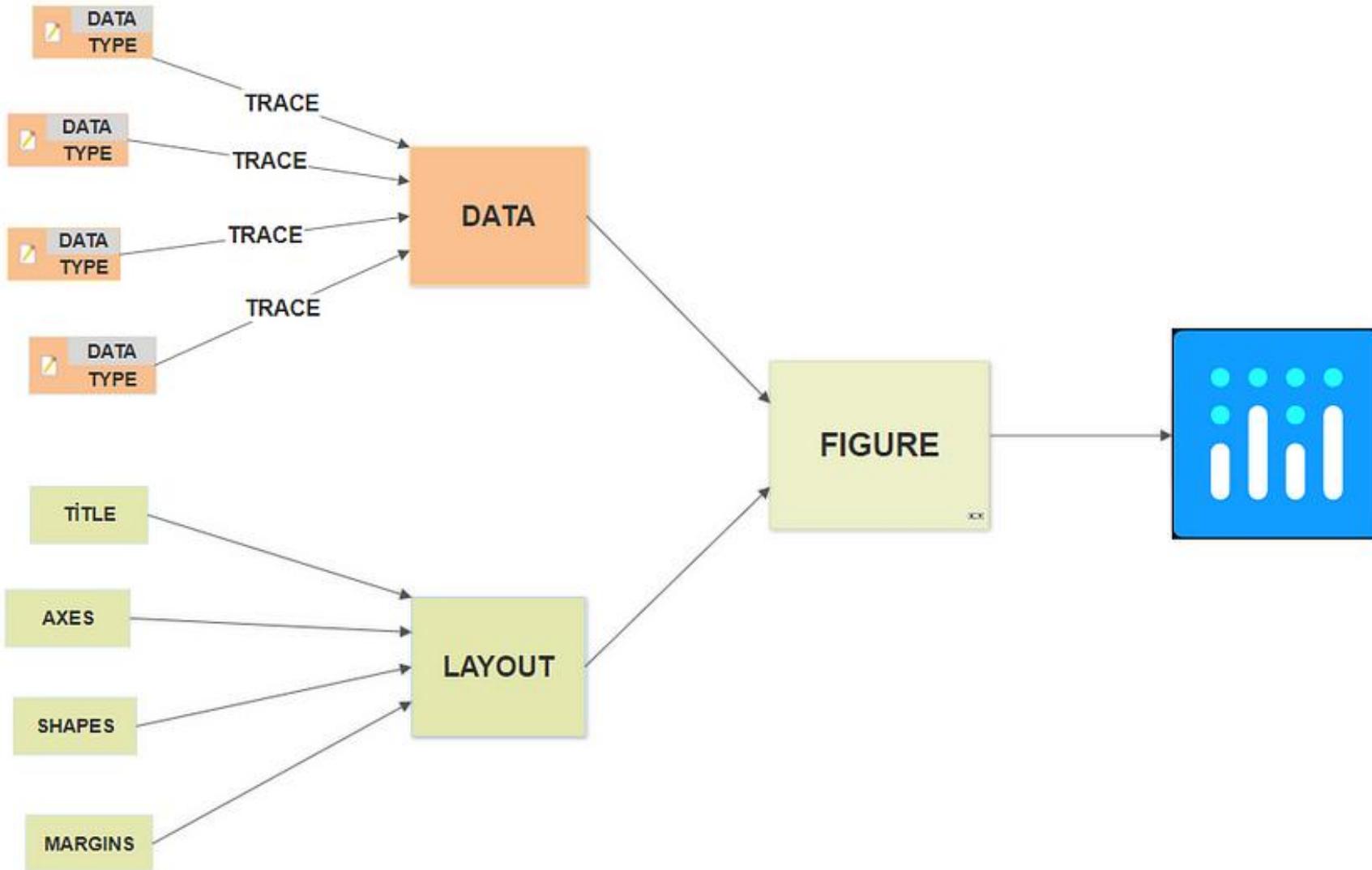
## 3. Plotly as a Pandas Backend

- ▶ 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

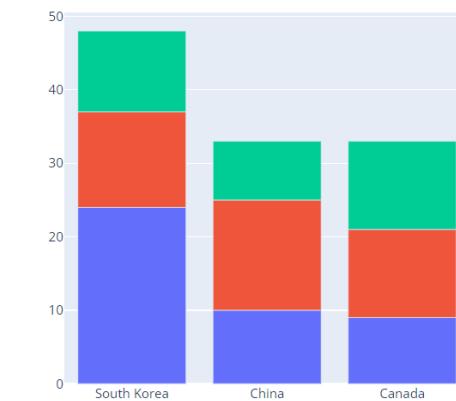
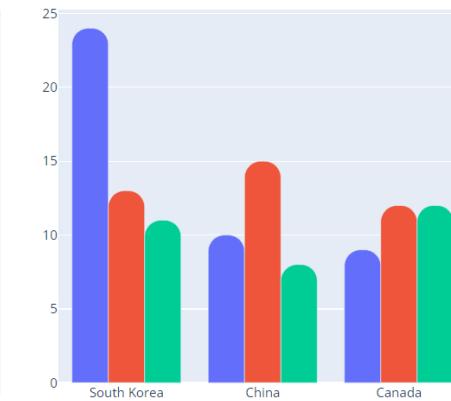
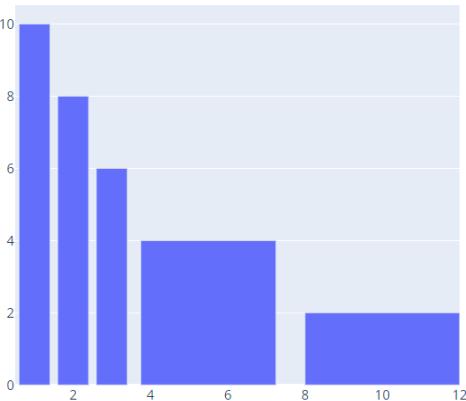
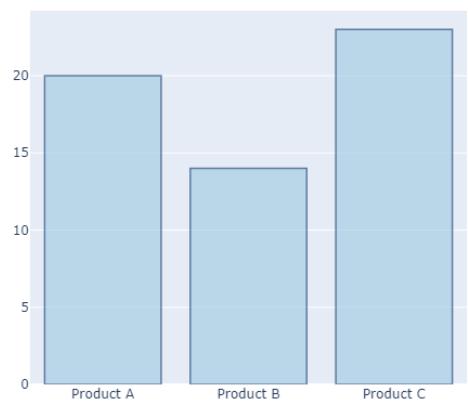
- ▶ type: scatter, bar, pie, heatmap, etc.
- ▶ data: x values, y values, ...
- ▶ attributes defining style (marker color, size, ...) and interactive behavior (tooltip)

**layout:** dictionary controlling the non-data components

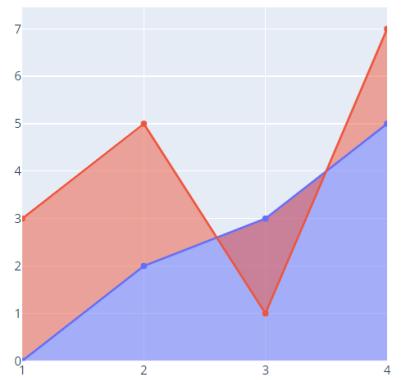
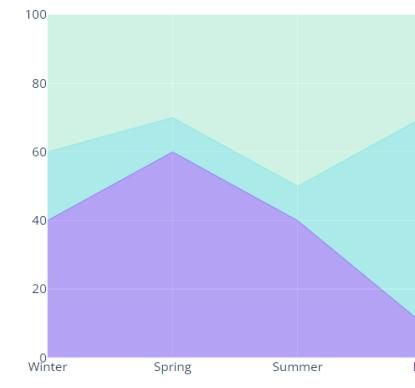
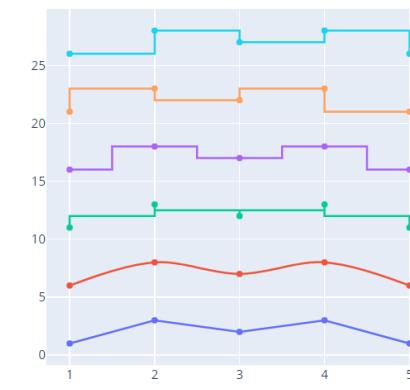
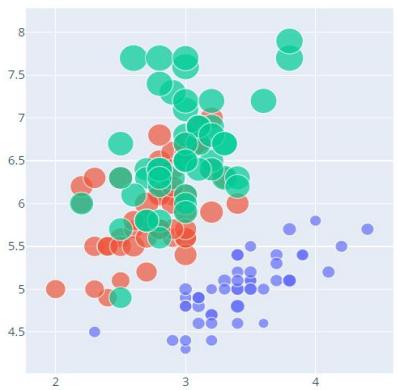
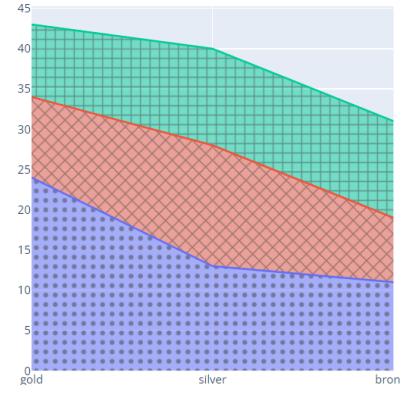
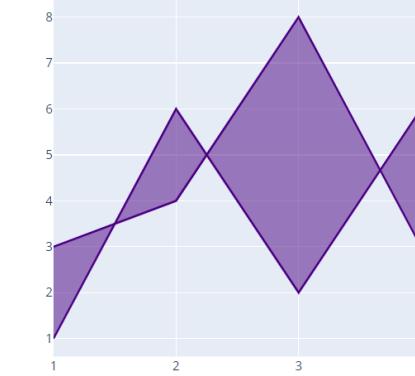
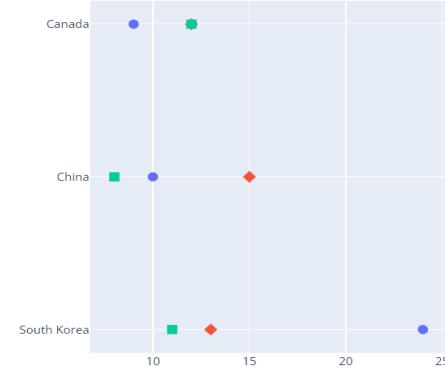
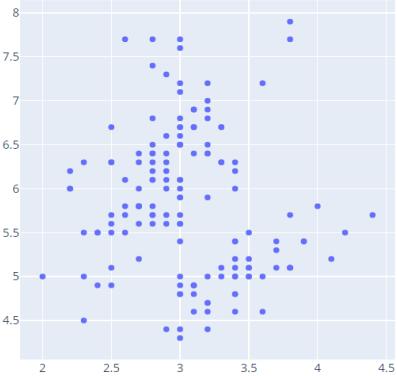
- ▶ Title
- ▶ Width and height
- ▶ Axes configuration
- ▶ ...

**frames :** used for animations to transition between different data states

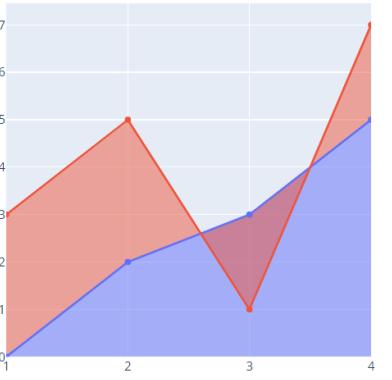
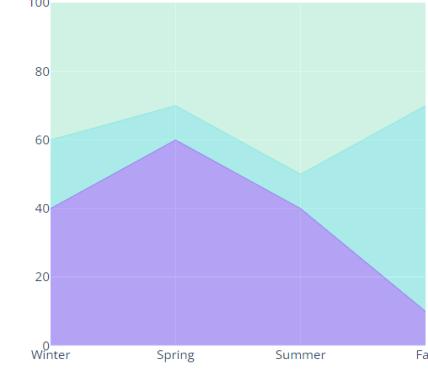
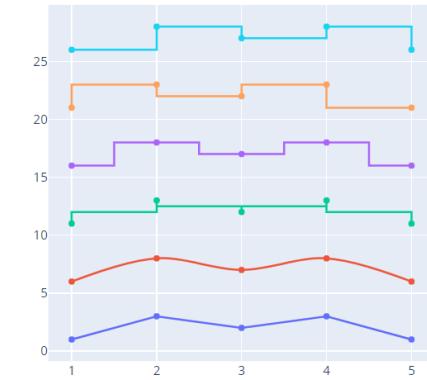
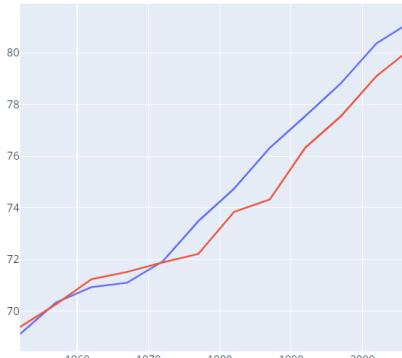
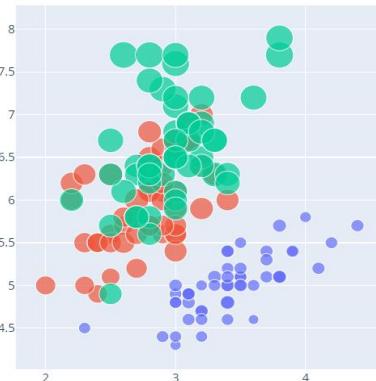
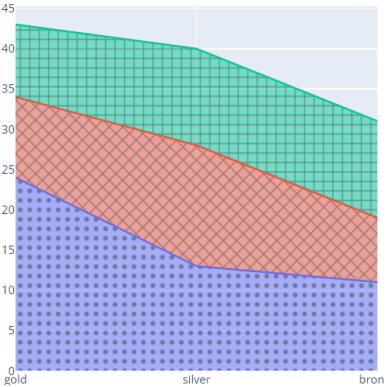
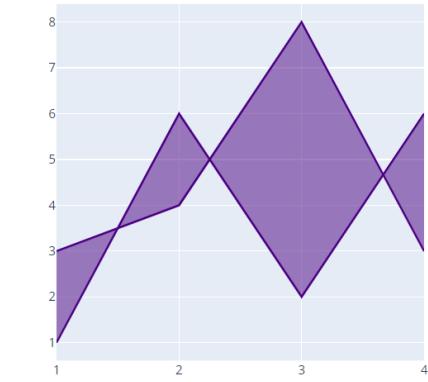
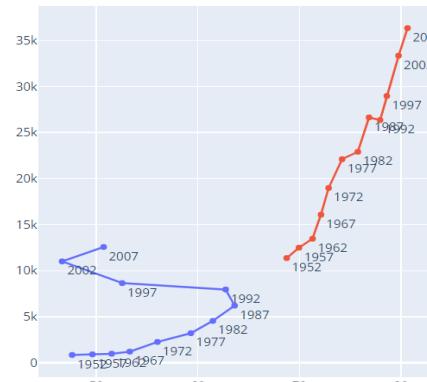
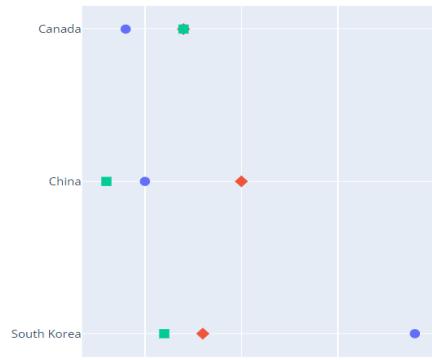
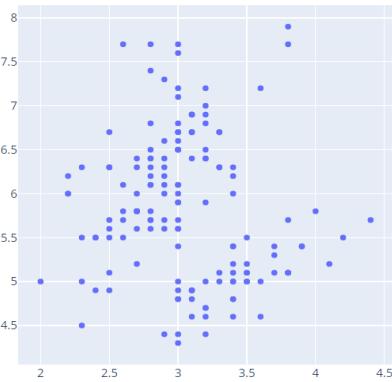
# Trace Type: Bar



## 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](https://plotly.com/python-api-reference/plotly.graph_objects.html)