KHANSA & RABEESHA

PYTHON LIBRARY
BOKEH

INTERACTIVE DATA VISUALIZATION

INTRODUCTION TO BOKEH

- Bokeh is a powerful Python library for creating interactive, web-based visualizations.
- Designed to bridge the gap between Python data analysis and modern web graphics.
- Built to make rich, interactive visualizations without needing JavaScript

USED BY

- Data Analysts & Scientists
- Machine Learning Engineers
- Web Developers

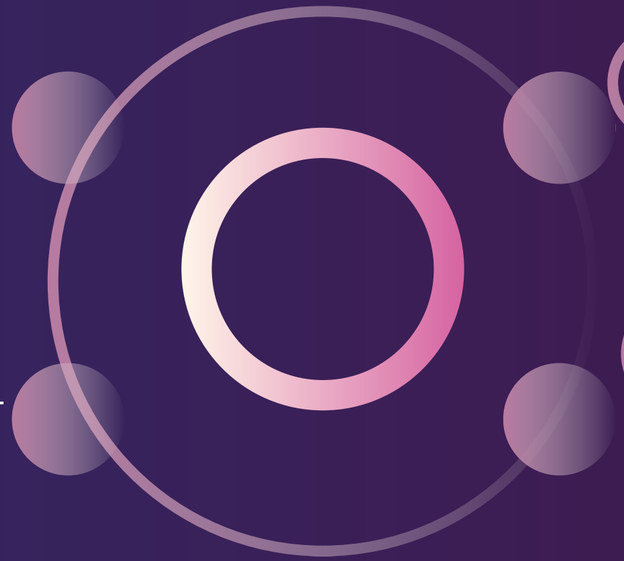
GOALS

- PRODUCE INTERACTIVE
- SHAREABLE VISUALS
- FOR EXPLORATION & DASHBOARDS

WHY BOKEH WAS CREATED

Traditional Python libraries (like Matplotlib) are mostly static.

Need for a library that outputs HTML + JS automatically.



Modern data exploration requires interaction, zoom, filters, and dashboards.

Bokeh solves this by combining Python simplicity with web visualization power.

KEY FEATURES OF BOKEH

Interactivity

Built-In
hover, zoom, pan

Web-ready

Generates Output HTML, Jupyter Notebook, Bokeh Server apps

Streaming datasets

Handles large and Streaming Datasets Efficiently

Python API

Similar Syntax
Simple API

Custom styling

Themes, toolbars, and widgets

WHY BOKEH IS USEFUL

- Lets you build interactive dashboards without JavaScript.
- Easily integrates with Pandas, NumPy, and scientific workflows.
- Produces clean, modern, responsive visuals suitable for presentations and websites.
- Great for exploratory data analysis.

BOKEH ARCHITECTURE

3 IMPORTANT LAYERS

BOKEHJS (BROWSER LAYER)

- JavaScript engine that renders plots in the browser.

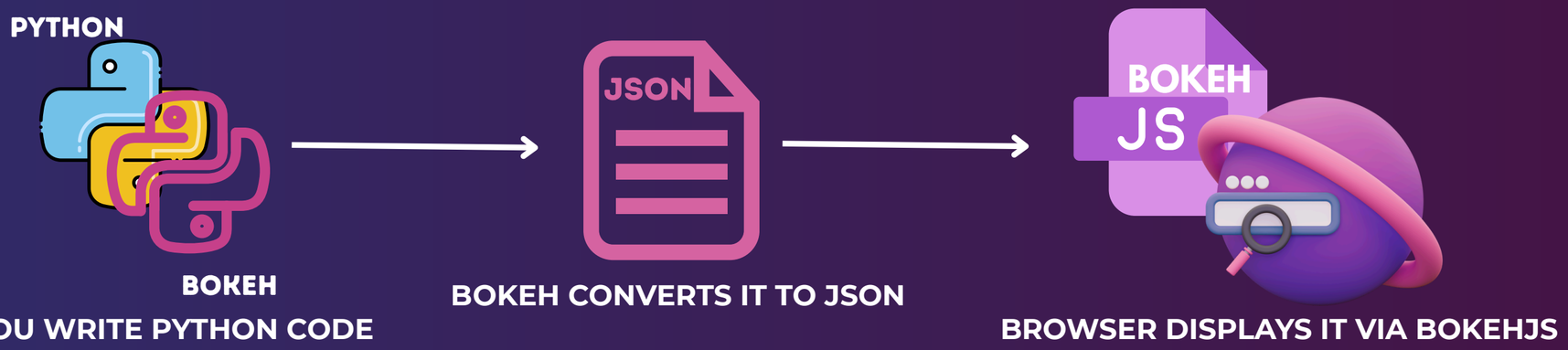
PYTHON LAYER

- High-level interface (e.g., figure(), line(), circle()).
- Converts Python code into JSON objects.

BOKEH SERVER

- Enables real-time updates, streaming, and callbacks.
- Allows Python code to stay running and interact with the browser.

HOW IT WORKS
(BEHIND THE SCENES)



YOU WRITE PYTHON CODE

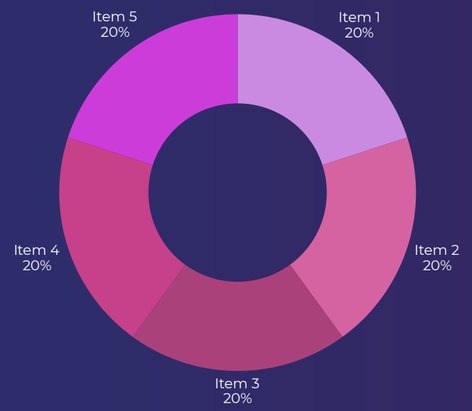
BOKEH

BOKEH CONVERTS IT TO JSON

BROWSER DISPLAYS IT VIA BOKEHJS

- Interactions (hover, zoom, selection) are handled directly in the browser.
- For advanced apps, Bokeh Server syncs browser events with Python.

CORE CONCEPTS IN BOKEH



- **Figure** → The canvas where your plot appears.
- **Glyphs** → Visual shapes like line(), circle(), rect(), vbar().
- **ColumnDataSource (CDS)** → Central data container; enables interactivity.
- **Tools** → Hover, zoom, pan, save, reset.
- **Layouts** → Organizing plots in rows, columns, and grids.
- **Widgets** → Sliders, dropdowns, buttons for interaction.

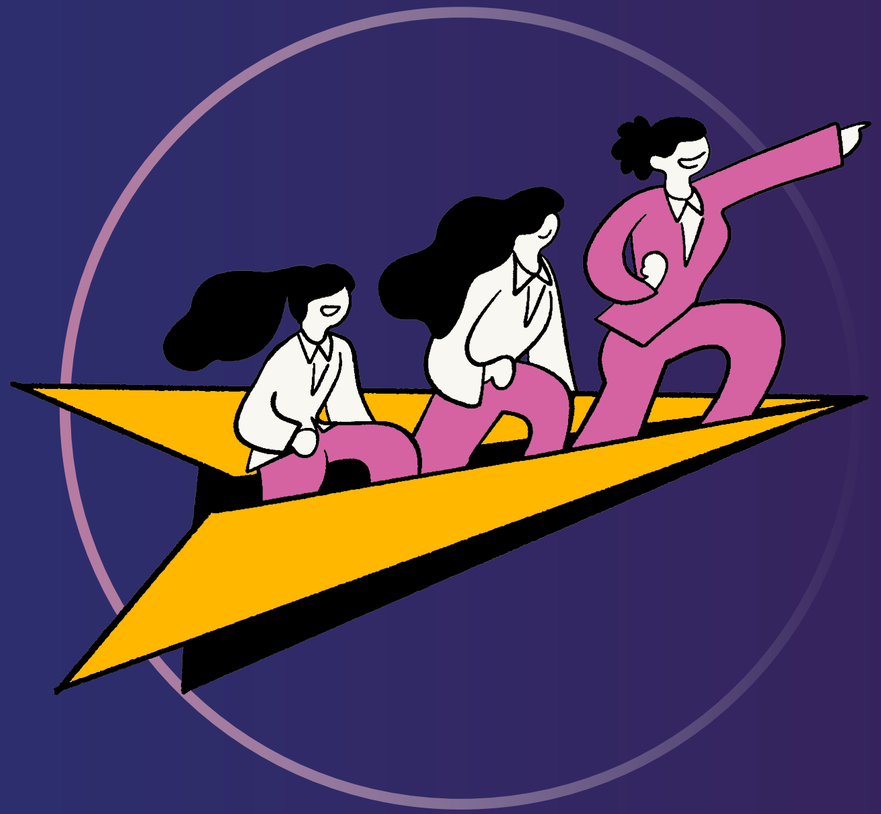
INTERACTIVITY IN BOKEH

- **Hover tooltips** → Show additional information.
- **Linked brushing** → Selecting points on one plot highlights on another.
- **Interactive legends** → Click legend items to hide/show data.
- **Widgets:**
  - Slider
  - Dropdown
  - Button
  - Checkbox
  - Date picker
- **Enables** dynamic dashboards with user input.

BOKEH SERVER

- A framework for building interactive web applications.
- Allows Python code to run continuously and update the plot.
- Ideal for:
  - Real-time dashboards
  - IoT data streams
  - Live model monitoring

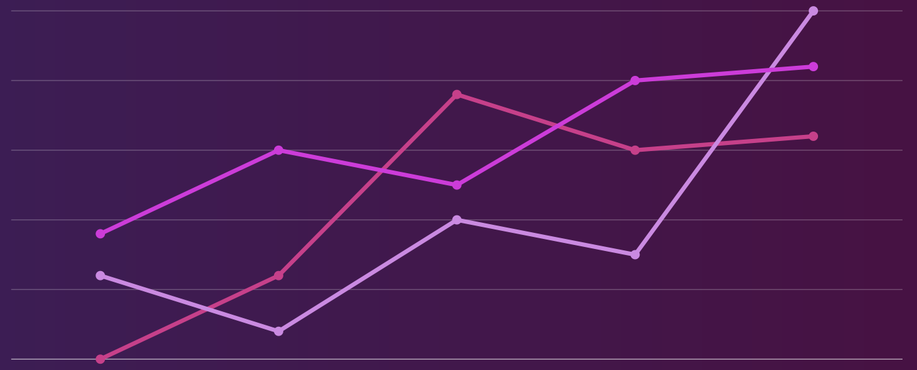
```
bokeh serve --show app.py
```



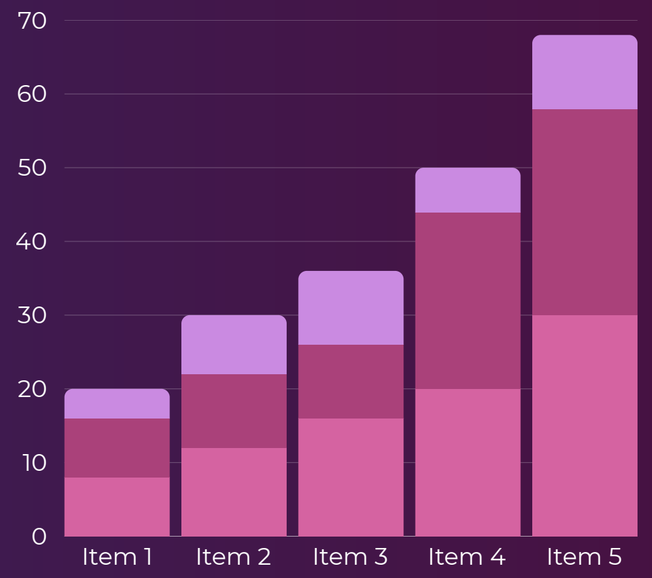
REAL-WORLD APPLICATIONS

- Financial dashboards (real-time stock prices).
- IoT Monitoring (sensor streams, live updates).
- Machine Learning insights (feature importance, SHAP, trees).
- Geographical maps (heatmaps, boundaries).
- Scientific visualization (experiment tracking, scatter matrices).
- Business analytics dashboards.

BOKEH VS OTHER LIBRARIES



MATPLOTLIB	TRADITIONAL STATIC PLOTS
SEABORN	STATISTICAL PLOTS & HEATMAPS
PLOTLY	HIGHLY INTERACTIVE, BUT HEAVIER
BOKEH	INTERACTIVE, WEB-READY, PYTHONIC, SCALABLE



THANK YOU!

QUESTIONS??