Easy Interactive Data Applications with Dash

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`whoami`

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My first dataviz stack

(please don't judge)

1. Bash, awk, sed, grep, etc
2. Gnuplot

My current dataviz stack

1. Jupyter notebooks + pandas
2. Matplotlib (sometimes Seaborn)

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- **Problem 2** (better?): they ask you to change small things all the time (e.g. axes limits)

- **Problem 3** (best?): they want to play around with the visualization themselves *aka* "Could you do it in Excel?" □

Or…

You just want to show off

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(that's fine too)

Enter Plotly.py

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- Python API for plotly.js
- Open source
- Interactive!
- Works well with Jupyter notebooks

Plotly.py

`plotly.graph_objects` contains the main components of a plot:

- `Figure` contains all info for the visualization (`data` and `layout`)
  - `Layout` contains all info for styling
  - `Scatter`, `Bar`, `Heatmap`, etc, express different type of graphs.

NOTE: These objects can always be swapped with python dicts

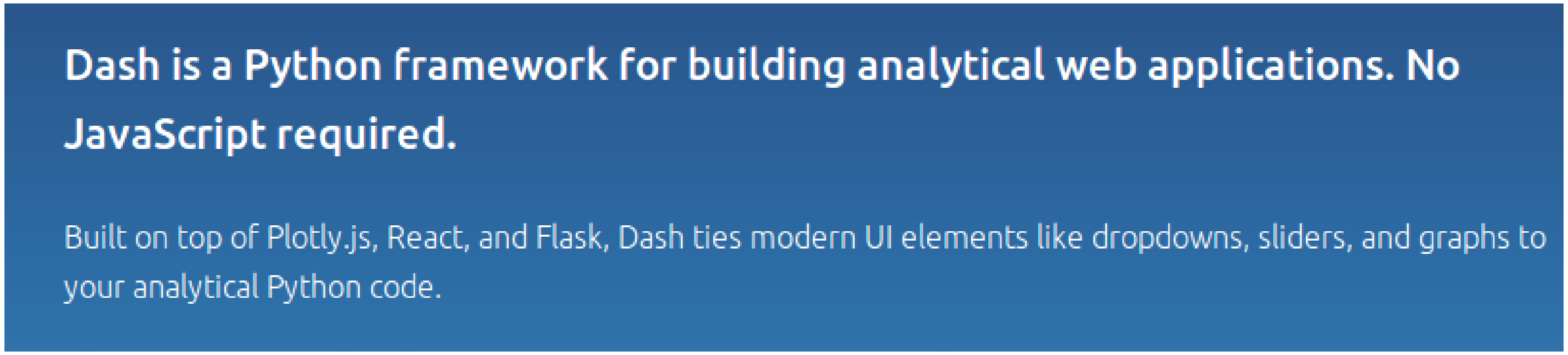
Plotly.py

Minimal plotly example:

```
import plotly.graph_objs as go
go.FigureWidget(data=[dict(x=[0,1,2], y=[3,4,2])])
```

Dash by Plotly

Dash by Plotly


Dash is a Python framework for building analytical web applications. No JavaScript required.

Built on top of Plotly.js, React, and Flask, Dash ties modern UI elements like dropdowns, sliders, and graphs to your analytical Python code.

https://plot.ly/products/dash/ (https://plot.ly/products/dash/)

Dash

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- Frontend: JS (Plotly, React)
- Backend: Flask
- You don't need to know any of that! (sort of...)

Minimal example

```
import dash
import dash_html_components as html

app = dash.Dash()

app.layout = html.Div('Hello EuroPython!' )

if __name__ == '__main__':
    app.run_server()
```

Dash - main components

- Layout (UI)
  - *html* components
  - *core* components
- Callbacks

Core Components

aka the moving, clickety stuff.

Example app with a lot of those (https://dash-oil-and-gas.plot.ly/)

Graphs

Core component that accepts plotly.py `go.Figure` object!

Graphs

```
import dash_core_components as dcc
import plotly.graph_objs as go

app.layout = html.Div([
        html.H1('Hello EuroPython!' ),
        dcc.Graph(
            id='my-first-graph' ,
            figure=dict(data=[dict(x=[0,1,2], y=[3,4,2])]),
            )
])
```

Callbacks

Where the magic happens!

Callbacks

```
from dash.dependencies import Input, Output

app.layout = html.Div([
    dcc.Input(id='my-id', value='initial value', type='text'),
    html.Div(id='my-div')
])

@app.callback(
    Output(component_id='my-div', component_property='children'),
    [Input(component_id='my-id', component_property='value')]
)
def update_output_div(input_value):
    return 'You\'ve entered "{}"'.format(input_value)
```

CSS

Let's make it prettier!

CSS

```
app.css.append_css({'external_url': 'https://codepen.io/chriddyp/pen/bWLwg
P.css'})
app.layout = html.Div([
    dcc.Input(id='my-id', value='initial value', type='text'),
    html.Div(id='my-div'),
],
    className='container',
)
```

To summarize

- Html components (HTML tags)
- "Core" components (sliders, buttons, graphs)
- Graph objects use Plotly.py objects
- Callbacks connect the pieces
- CSS classes for pretty layout and styling

Deployment

Did I mention you don't need to know any Flask, JS, etc...?

Deployment

Did I mention you don't need to know any Flask, JS, etc...?

I lied.

Deployment

Deployment

You have choices:

1. Don't bother (1-person, local use only)
2. Know Flask
3. PaaS (e.g. Heroku, Digital Ocean)
4. Ask your engineer friend (*aka* Stack Overflow)
5. Ask Plotly (probably not for free)

Extra fancy stuff

(Non-exhaustive list)

- External JS
- Caching
- Optional WebGL graphs for billion-point visualization (actually >15K)
- Live updates
- Authentication

So, it’s cool and all, but…

So, it’s cool and all, but...

- You still need a web designer ¯_(ツ)_/¯
- Understanding/debugging JS errors
- Offline mode not well supported yet/erratic
- Deployment at scale might not be trivial (but Heroku!)

I made something

twitch-viz.herokuapp.com (https://twitch-viz.herokuapp.com)

Questions?

Tweet at me `@_teoguso`

Further Reading/Help

- User guide: https://dash.plot.ly/ (https://dash.plot.ly/)
- Community Forum: https://community.plot.ly/ (https://community.plot.ly/)