

Student name:

Student ID:

SIT225: Data Capture Technologies

Activity 6.1: Plotly data dashboard

Plotly Dash apps give a point-&-click interface to models written in Python, vastly expanding the notion of what's possible in a traditional "dashboard". With Dash apps, data scientists and engineers put complex Python analytics in the hands of business decision-makers and operators. In this activity, you will learn basic building blocks of Plotly to create Dash apps.

Hardware Required

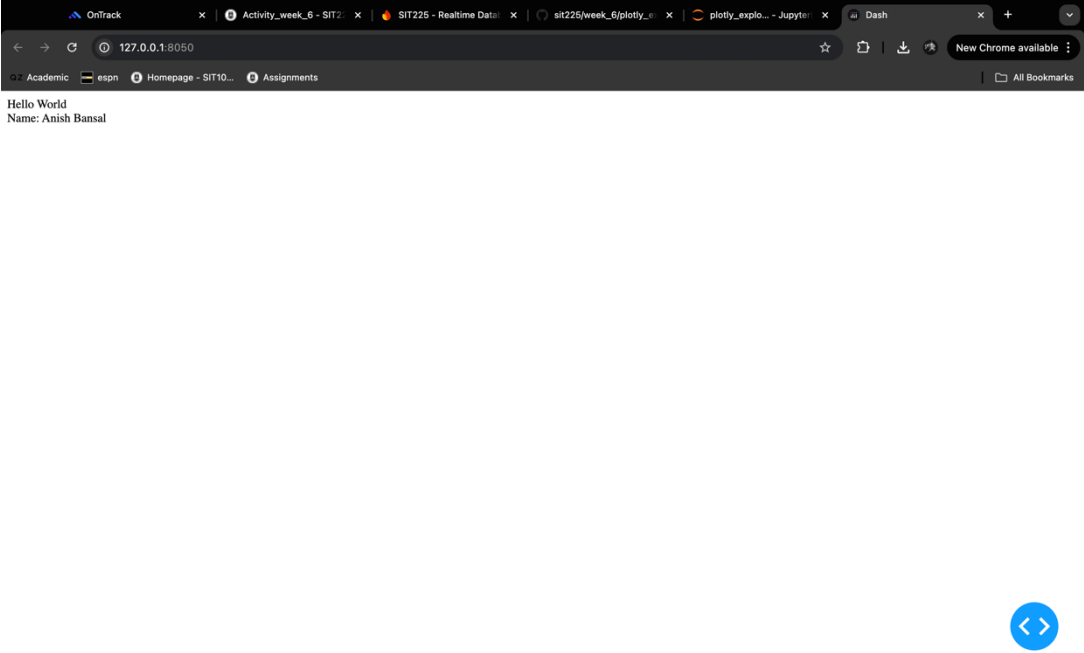
No hardware is required.

Software Required

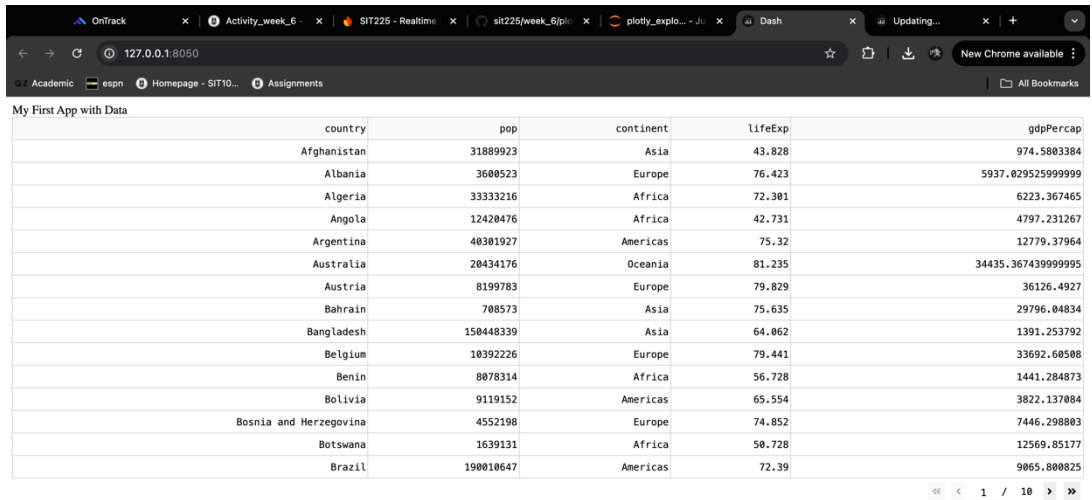
Plotly library and Dash module
Python 3

Steps

Step	Action
1	<p>Install Plotly and dash using the command below in the command line.</p> <pre>\$ pip install plotly dash</pre> <p>You can download Jupyter Notebook from here (https://github.com/deakin-deep-dreamer/sit225/blob/main/week_6/plotly_explore.ipynb) and run all the cells. The Notebook contains multiple sections such as Hello World which follows a sample code in a following cell. If you run the Hello world cell it will show Plotly Dash web page. The cell also includes a Question (**** Question) which you will need to carry out to get a modified output. You will need to capture the output and share the screenshot in the following steps.</p>

2	<p>Question: Hello World cell has a question - add another html.Div to show your name, and re-run the cell for output. You will need to update the code, run the cell, capture the screenshot of the output and paste it here.</p> <p>Answer: <Your answer></p>  <p>The screenshot shows a web browser window with multiple tabs. The active tab is titled 'Dash' and shows a simple web page with the text 'Hello World' and 'Name: Anish Bansal'. The browser's address bar shows the URL '127.0.0.1:8050'. The browser interface includes a back button, a search bar, and a 'New Chrome available' notification. A blue circular button with a double arrow icon is visible in the bottom right corner of the browser window.</p>
3	<p>Question: Connecting to Data cell has a question - change page size and observe the change in widget controls such as, total number of pages. You will need to update the code, run the cell, capture the screenshot of the output and paste it here.</p>

Answer: <Your answer>



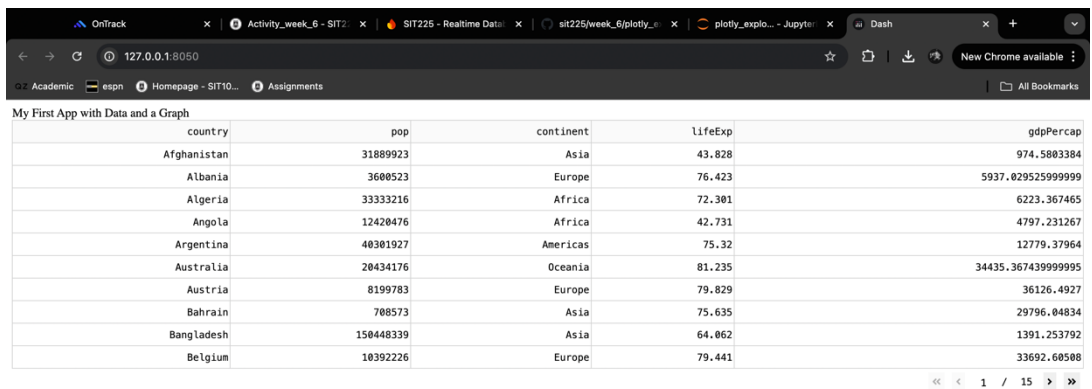
The screenshot shows a web browser with multiple tabs. The active tab is 'Dash'. The address bar shows '127.0.0.1:8050'. The page title is 'My First App with Data'. The table displays data for 20 countries, including columns for country, pop, continent, lifeExp, and gdpPercap. The table is paginated, showing 10 rows out of 20.

country	pop	continent	lifeExp	gdpPercap
Afghanistan	31889923	Asia	43.828	974.5803384
Albania	3600523	Europe	76.423	5937.029525999999
Algeria	33333216	Africa	72.301	6223.367465
Angola	12420476	Africa	42.731	4797.231267
Argentina	40301927	Americas	75.32	12779.37964
Australia	20434176	Oceania	81.235	34435.367439999995
Austria	8199783	Europe	79.829	36126.4927
Bahrain	708573	Asia	75.635	29796.04834
Bangladesh	150448339	Asia	64.062	1391.253792
Belgium	10392226	Europe	79.441	33692.60508
Benin	8078314	Africa	56.728	1441.284873
Bolivia	9119152	Americas	65.554	3822.137084
Bosnia and Herzegovina	4552198	Europe	74.852	7446.298803
Botswana	1639131	Africa	50.728	12569.05177
Brazil	190810647	Americas	72.39	9065.800825

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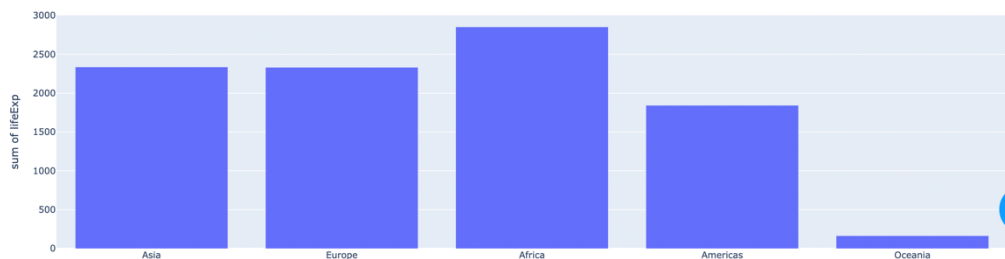
Question: Visualising data cell has a question - explore another histfunc other than 'avg' used above and observe behaviour. You will need to update the code, run the cell, capture the screenshot of the output and paste it here.

Answer: <Your answer>



The screenshot shows a web browser with multiple tabs. The active tab is 'Dash'. The address bar shows '127.0.0.1:8050'. The page title is 'My First App with Data and a Graph'. The table displays data for 10 countries, including columns for country, pop, continent, lifeExp, and gdpPercap. The table is paginated, showing 10 rows out of 15.

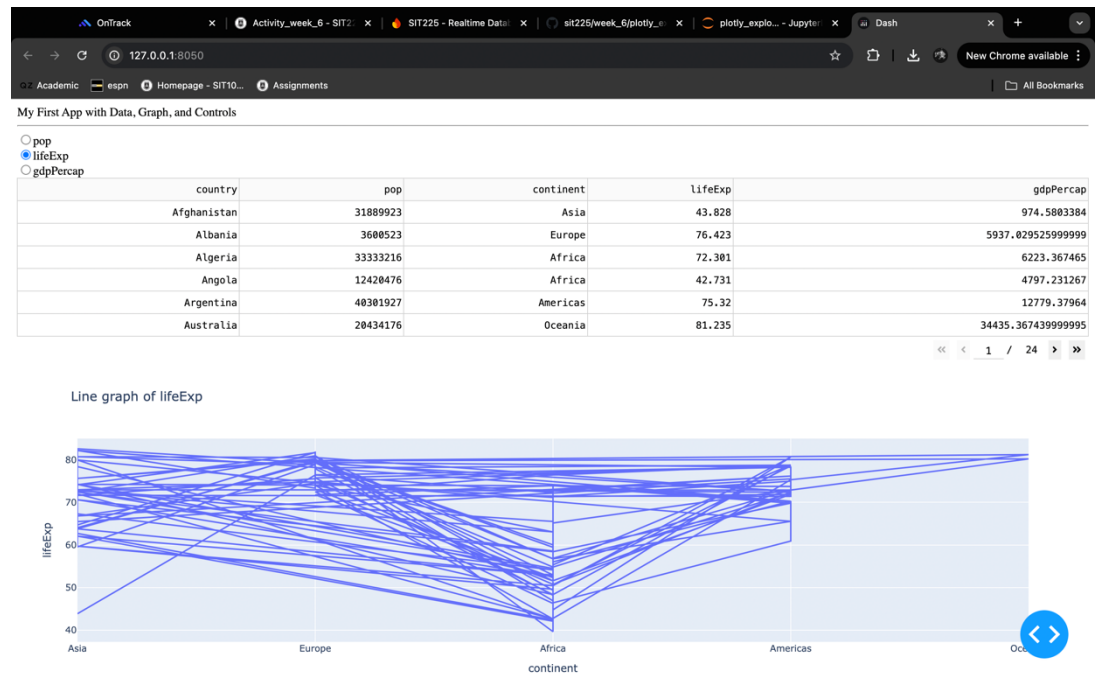
country	pop	continent	lifeExp	gdpPercap
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Bahrain	708573	Asia	75.635	29796.04834
Bangladesh	150448339	Asia	64.062	1391.253792
Belgium	10392226	Europe	79.441	33692.60508



5

Question: Controls and Callbacks cell has a question - use line graphs instead of histogram. You will need to update the code, run the cell, capture the screenshot of the output and paste it here.

Answer: <Your answer>



6

Question: Now you have learned how to use Plotly Dash for visualising your data, describe how you will be using this tool for your desired sensor monitoring dashboard with a number of sensors including DHT22 or accelerometer data.

Answer: <Your answer> To use **Plotly Dash** for visualizing sensor data, including data from the **DHT22 sensor** (which measures temperature and humidity) and an **accelerometer** (which measures acceleration along the x, y, and z axes), the dashboard can be designed as follows:

1. Real-time Data Visualization

- **Multiple Sensors:** The dashboard will handle data from various sensors like the DHT22 (temperature and humidity) and an accelerometer (x, y, z-axis data). Each sensor will stream data to the dashboard in real-time.
- **Sensor Specific Graphs:** For each sensor, different visualizations will be used:
 - **DHT22:** Line graphs to display **temperature** and **humidity** changes over time.

- **Accelerometer:** Separate line graphs for **x**, **y**, and **z** data to monitor motion or tilt. A combined graph can also be used to show the relationship between the three axes.

2. Interactive Controls and Customization

- **Radio Buttons / Dropdowns:** Users will have controls (such as radio buttons or dropdown menus) to select which data to view (temperature, humidity, or any of the x, y, z axes of the accelerometer).
- **Live Graph Updates:** Dash's callbacks will ensure that whenever a sensor reading changes, the graph updates in real-time, making it useful for monitoring dynamic environments.

3. Plotly's Graphical Capabilities

- **Interactivity:** Users will be able to zoom in on specific timeframes, hover over points to see exact values, and even filter data as needed using sliders and other widgets provided by Plotly Dash.
- **Customization Options:** Custom tooltips, legends, axis labels, and titles will be used to make the visualizations user-friendly and informative.

4. Handling Data from Multiple Sensors

- **Data Handling:** Data from different sensors will be stored and retrieved in real-time, likely from a Firebase database or any other backend storage. Plotly Dash will continuously update the graphs based on this data stream, ensuring a smooth flow of information.
- **Multiple Graphs:** The dashboard can accommodate multiple graphs for different sensor types, each graph being updated independently. A section of the dashboard can display a snapshot of the latest data values for quick reference.

5. Custom Layout

- The dashboard will use **Dash's layout components** (such as `html.Div`, `dcc.Graph`, and `dash_table.DataTable`) to display different graphs and data tables. These components will be arranged in a way that allows the user to quickly access the information they need.

6. Real-World Use Case

For example, the dashboard could be used in a smart home application where the DHT22 sensor monitors room conditions, and the accelerometer checks the position of household objects. The dashboard will display this data in real-time and alert users to any significant changes.

Summary:

In summary, Plotly Dash can be used to create an efficient, real-time dashboard for monitoring sensor data, allowing for easy interaction and visualization of data from various sensors. The customization options in Plotly Dash make it a suitable tool for creating comprehensive and user-friendly sensor dashboards.

7	<p>Question: Convert the Notebook to PDF and merge with this activity sheet PDF. You will need this merged PDF to combine with this week's OnTrack task for submission.</p> <p>Answer: <Your answer></p>
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