How to Enabled Geospatial Interactivity Using ipywidgets and Folium

Getting Started

To enable geospatial interactivity in Jupyter Notebooks using ipywidgets and Folium, you need to install the required packages and prepare a clean dataset with spatial references (latitude and longitude).

Features

- Dynamic dropdown selection of sensor types (e.g., `TPH.TEMP`, `PM2.5`)
- Live map updates based on user input
- Improved spatial insight through interactive controls

Step-by-Step Implementation

Step 1: Install Required Libraries

Use the following command to install required packages:

!pip install folium ipywidgets pandas

Step 2: Load Your Dataset

Ensure your dataset contains at least the following columns:
- Latitude
- Longitude
- Sensor Type
- Sensor Reading

Step 3: Initialize Folium Map

Create a base map centered on your area of interest:

```python
import folium
m = folium.Map(location=[-37.8136, 144.9631], zoom_start=12)
```

Step 4: Create Dropdown Widget

Use ipywidgets to create a dropdown menu for sensor types:

```python
import ipywidgets as widgets
dropdown = widgets.Dropdown(
    options=df['SensorType'].unique(),
    description='Sensor:',
    disabled=False,
)
```

Step 5: Add Interactivity

Define a function to update the map based on the selected sensor:

```python
from IPython.display import display, clear_output

def update_map(sensor):
    clear_output(wait=True)
    m = folium.Map(location=[-37.8136, 144.9631], zoom_start=12)
    for _, row in df[df['SensorType'] == sensor].iterrows():
        folium.CircleMarker(
            location=[row['Latitude'], row['Longitude']],
            radius=5,
            popup=f"{row['SensorValue']} ({sensor})",
            color='blue',
            fill=True
        ).add_to(m)
    display(dropdown)
    display(m)

dropdown.observe(lambda change: update_map(change.new), names='value')
update_map(dropdown.value)
```

Conclusion

Integrating ipywidgets with Folium maps allows for an interactive user experience in Jupyter Notebooks. This combination enables users to explore environmental sensor data dynamically and enhances the analytical value of geospatial data. It is especially useful in urban planning, environmental monitoring, and educational demonstrations.

Author

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