Generating Geographical Heatmap

1. **Task Description**
   Create a geographical heatmap using Matplotlib and geographical data (e.g., basemap).

A geographical heatmap is a visualization that overlays data on a map, showing spatial distribution using color intensity. Here's how you can create such a map using Python with Matplotlib and the Basemap library.

Key Steps:

1. **Install Dependencies**: Ensure you have the required libraries:
   - `matplotlib`
   - `basemap` (or alternatives like `cartopy` for modern mapping)
   - `numpy`
   - `pandas` (optional, if you process tabular data)

2. • You can install them using:
3. `bash`
4. `Copy code`
5. `pip install matplotlib basemap numpy pandas`
6. • **Prepare Data**: Obtain geographical data (latitude, longitude, and a metric like temperature or population density).
7. • **Create the Heatmap**: Use Basemap to plot a map and overlay your heatmap data using `pcolormesh` or `scatter`.

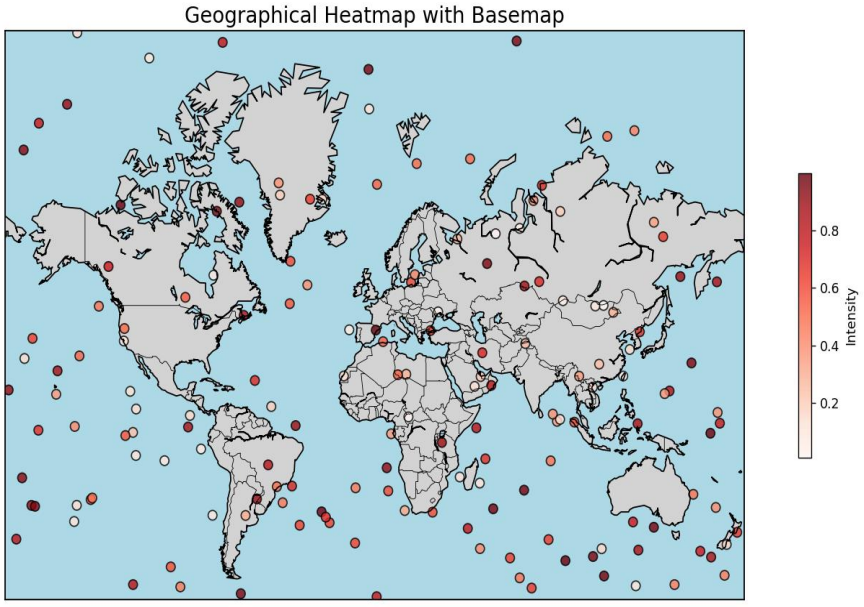
Output Explanation:

- **Map Features**: Coastlines, countries, and states are drawn using Basemap.

- **Heatmap**: Data points are plotted as circles, with color intensity representing values.
- **Customization**: You can adjust `alpha`, `cmap`, and marker size to fit your needs.

If you need further help with a specific dataset or want to try Cartopy instead of Basemap.

2.Task Output



- **CODE:**

```
import numpy as np
```

```
import matplotlib.pyplot as plt
from mpl_toolkits.basemap import Basemap

np.random.seed(42)
num_points = 200
lats = np.random.uniform(-90, 90, num_points)
lons = np.random.uniform(-180, 180, num_points)
data_intensity = np.random.rand(num_points)

plt.figure(figsize=(12, 8))
m = Basemap(projection="merc", llcrnrlat=-60, urcrnrlat=85, llcrnrlon=-
180, urcrnrlon=180, resolution="c")

m.drawcoastlines()
m.drawcountries()
m.drawmapboundary(fill_color="lightblue")
m.fillcontinents(color="lightgray", lake_color="lightblue")

x, y = m(lons, lats)

scatter = m.scatter(x, y, c=data_intensity, cmap="Reds", s=50,
alpha=0.8, edgecolors="k")

cb = plt.colorbar(scatter, orientation="vertical", shrink=0.5,
pad=0.05)
cb.set_label("Intensity")

plt.title("Geographical Heatmap with Basemap", fontsize=16)

plt.show()
```