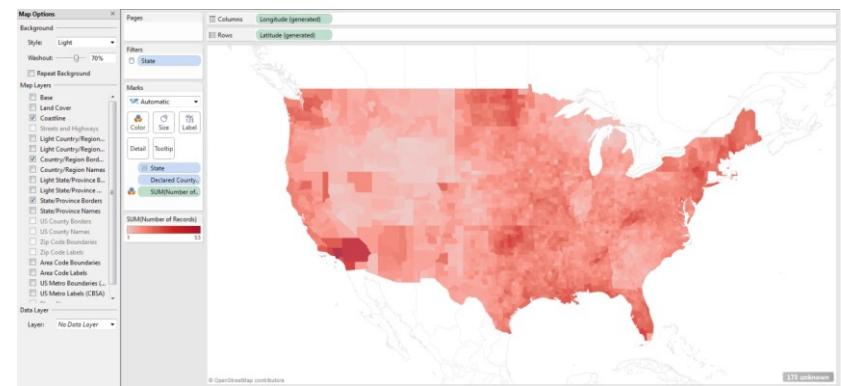
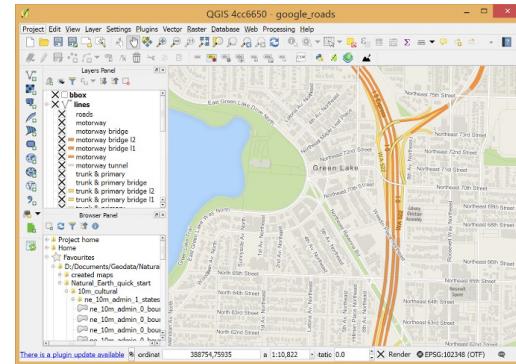


# Spatial Analysis and Visualization with Python

Veera Muangsin

# Spatial Analysis & Viz Tools

- GIS software
  - QGIS <https://www.qgis.org/>
  - ESRI ArcGIS
- Business Intelligence
  - PowerBI
  - Tableau
- Python Libraries
  - Geopandas
  - Folium
  - PyDeck

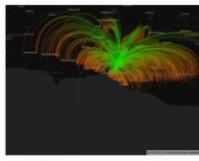


# Python Geospatial Libraries

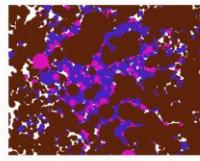
Layer	Package	Description
Spatial Data I/O	<b>fiona</b>	Reading, writing, and processing geospatial vector data (Shapefile, GeoJSON)
	<b>rasterio</b>	Reading, writing, and processing geospatial raster data (GeoTIFF)
Geoprocessing	<b>geopandas</b>	Extend Pandas to handle geospatial data
	<b>shapely</b>	Provide tools for geometric operations and spatial analysis
	<b>pyproj</b>	Handle coordinate transformations and projections
Geovisualization	<b>folium</b>	Interactive maps based on leaflet.js
	<b>pydeck</b>	Visualizing large-scale datasets on interactive and intuitive maps powered by deck.gl, a WebGL-powered framework.
	<b>ipyleaflet</b>	Interactive maps directly within Jupyter notebooks
	<b>kepler</b>	Browser-based interactive maps for large number of data points
Spatial Analysis	<b>geoplot</b>	Static high-quality maps
	<b>PySAL</b>	Spatial econometrics, exploratory spatial data analysis, and geographic data visualization.
	<b>Scikit-learn</b>	Machine Learning Libraries: statistical modeling, geostatistical analysis, and
	<b>Scikit-gstat</b>	mobility pattern mining, suitable for a range of tasks from predictive analytics to
	<b>Scikit-mobility</b>	spatial data interrogation and movement prediction.

# PyDeck

- PyDeck is a Python wrapper for the JavaScript library Deck.gl, which is a powerful, web-based data visualization framework created by Uber.
  - <https://deck.gl/>
  - <https://deckgl.readthedocs.io/en/latest/>
- pip install pydeck



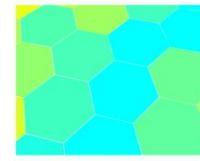
ArcLayer



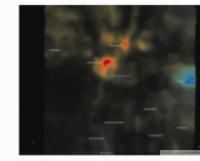
Binary Transport



BitmapLayer



H3HexagonLayer



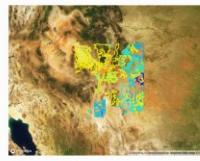
HeatmapLayer



HexagonLayer



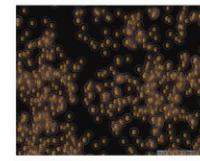
ColumnLayer



ContourLayer



CustomLayer



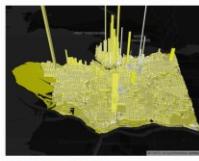
IconLayer



LineLayer



PathLayer



GeoJsonLayer



Geopandas Integration



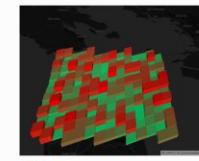
GlobeView



PointCloudLayer



PolygonLayer



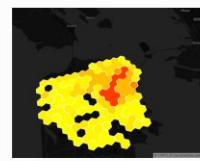
S2Layer



GreatCircleLayer



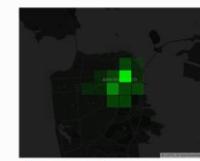
GridLayer



H3ClusterLayer



ScatterplotLayer



ScreengridLayer



TerrainLayer

# Pydeck Components

- Layer
  - Define a layer to display on the map
  - `pdk.Layer()`
  - <https://deckgl.readthedocs.io/en/latest/layer.html>
- ViewState
  - In PyDeck, a viewport represents the area through which users view the map. The viewport is configured via a ViewState object.
  - `pdk.ViewState()`
  - `pdk.data_utils.compute_view()`
  - [https://deckgl.readthedocs.io/en/latest/view\\_state.html](https://deckgl.readthedocs.io/en/latest/view_state.html)
- Draw
  - Render the map based on the layer(s), initial view state, and other configurations.
  - `pdk.Deck()`
  - <https://deckgl.readthedocs.io/en/latest/deck.html>

# Pydeck: Scatter Plot

Simplify version of the example in [https://deckgl.readthedocs.io/en/latest/gallery/scatterplot\\_layer.html](https://deckgl.readthedocs.io/en/latest/gallery/scatterplot_layer.html)

```
import pydeck as pdk
import pandas as pd

df = pd.read_json("https://raw.githubusercontent.com/visgl/deck.gl-data/master/website/bart-stations.json")

# Define a layer to display on a map
layer = pdk.Layer(
    "ScatterplotLayer",
    df,
    get_position="coordinates",
    get_radius=500,
    get_fill_color=[255, 140, 0],
    pickable=True
)

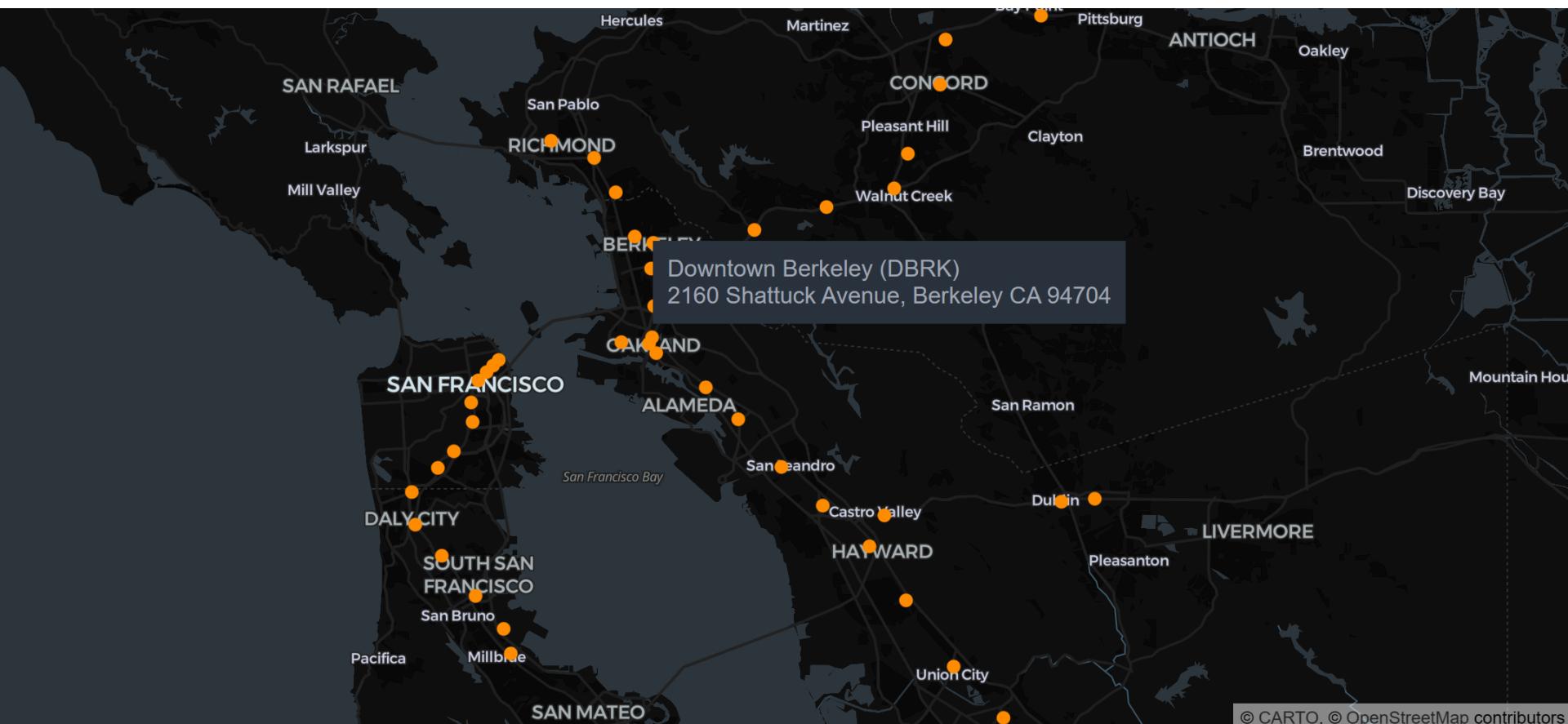
# Set the viewport location
view_state = pdk.ViewState(latitude=37.7749295, longitude=-122.4194155, zoom=10)

# Render
r = pdk.Deck(layers=[layer], initial_view_state=view_state, tooltip={"text": "{name}\n{address}"})

# Save as HTML
r.to_html("pydeck_scatterplot.html")
```

	name	code	address	entries	exits	coordinates
0	Lafayette (LAFY)	LF	3601 Deer Hill Road, Lafayette CA 94549	3481	3616	[-122.123801, 37.893394]
1	12th St. Oakland City Center (12TH)	12	1245 Broadway, Oakland CA 94612	13418	13547	[-122.271604, 37.803664]
2	16th St. Mission (16TH)	16	2000 Mission Street, San Francisco CA 94110	12409	12351	[-122.419694, 37.765062]

# Pydeck: Scatter Plot



# Pydeck: Heatmap

```
import pydeck as pdk
import pandas as pd

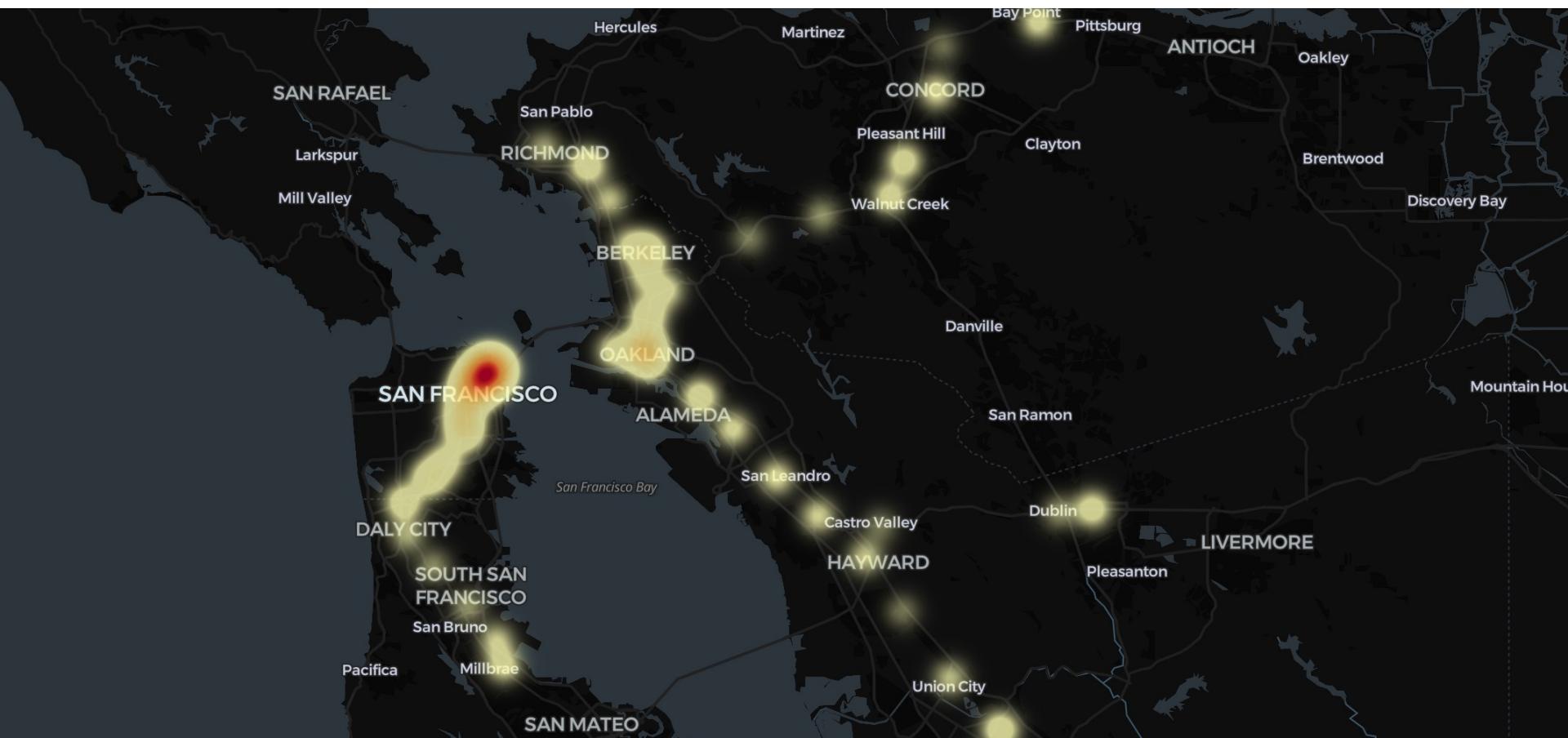
df = pd.read_json("https://raw.githubusercontent.com/visgl/deck.gl-data/master/website/bart-stations.json")

# Define a layer to display on a map
layer = pdk.Layer(
    "HeatmapLayer",
    df,
    get_position="coordinates",
    get_weight="exits",
    opacity=0.6,
)

# Set the viewport location
view_state = pdk.ViewState(latitude=37.7749295, longitude=-122.4194155, zoom=10)

# Render
pdk.Deck(layers=[layer], initial_view_state=view_state)
```

# Pydeck: Heatmap



# Streamlit

<https://docs.streamlit.io/get-started/tutorials/create-an-app>

```
import streamlit as st
import pandas as pd
import numpy as np

st.title('Uber pickups in NYC')

DATE_COLUMN = 'date/time'
DATA_URL = ('https://s3-us-west-2.amazonaws.com/streamlit-demo-data/uber-raw-data-sep14.csv.gz')

@st.cache_data
def load_data(nrows):
    data = pd.read_csv(DATA_URL, nrows=nrows)
    lowercase = lambda x: str(x).lower()
    data.rename(lowercase, axis='columns', inplace=True)
    data[DATE_COLUMN] = pd.to_datetime(data[DATE_COLUMN])
    return data

data_load_state = st.text('Loading data...')
data = load_data(10000)
data_load_state.text("Done! (using st.cache_data)")

if st.checkbox('Show raw data'):
    st.subheader('Raw data')
    st.write(data)

st.subheader('Number of pickups by hour')
hist_values = np.histogram(data[DATE_COLUMN].dt.hour, bins=24, range=(0,24))[0]
st.bar_chart(hist_values)

# Some number in the range 0-23
hour_to_filter = st.slider('hour', 0, 23, 17)
filtered_data = data[data[DATE_COLUMN].dt.hour == hour_to_filter]

st.subheader('Map of all pickups at %s:00' % hour_to_filter)
st.map(filtered_data)
```

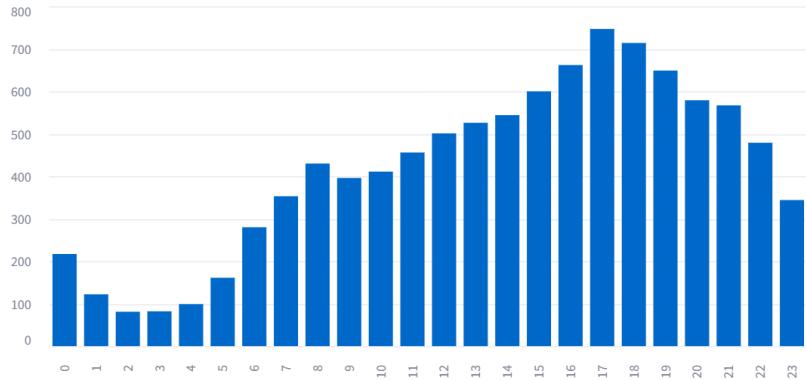
streamlit\_uber.py

# Uber pickups in NYC

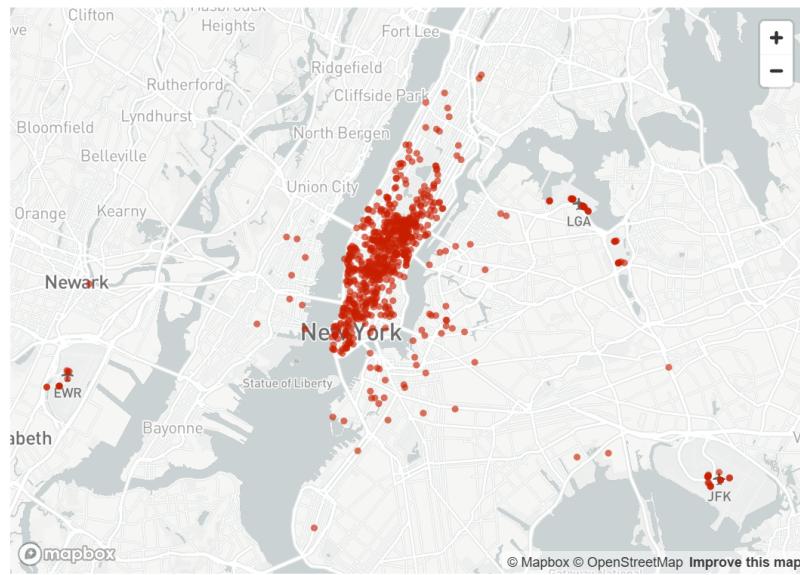
Done! (using st.cache\_data)

Show raw data

## Number of pickups by hour



## Map of all pickups at 17:00



# Streamlit + PyDeck: Uber

Map Settings

Select Base Map Style

Dark

Show raw data

## Uber pickups in NYC

Filter by Hour Range

Select hour range

0 23

Showing 10000 pickups between 0:00 and 23:00

### Pickup Distribution in Selected Time Range

A bar chart titled "Pickup Distribution in Selected Time Range" showing the number of pickups per hour. The x-axis represents hours from 0 to 23, and the y-axis represents the count of pickups from 0 to 800. The distribution is skewed right, with the highest volume occurring around 17:00.

Hour	Pickups
0	220
1	120
2	80
3	90
4	100
5	150
6	280
7	350
8	450
9	420
10	430
11	460
12	520
13	550
14	560
15	600
16	680
17	750
18	720
19	650
20	580
21	560
22	480
23	350

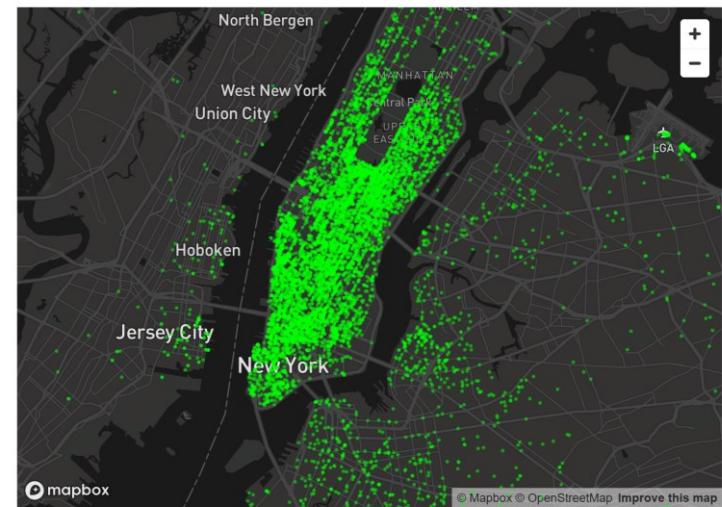
streamlit\_pydeck\_uber.py

## Map of all pickups between 0:00 and 23:00

Select Map Type

Points

Heatmap



# Streamlit + PyDeck

Map Type

- ScatterplotLayer
- HeatmapLayer

Map Style

- mapbox://styles/mapbox/light-v11
- mapbox://styles/mapbox/dark-v11
- mapbox://styles/mapbox/streets-v11
- mapbox://styles/mapbox/satellite-v9

Opacity

0.50

Radius Scale

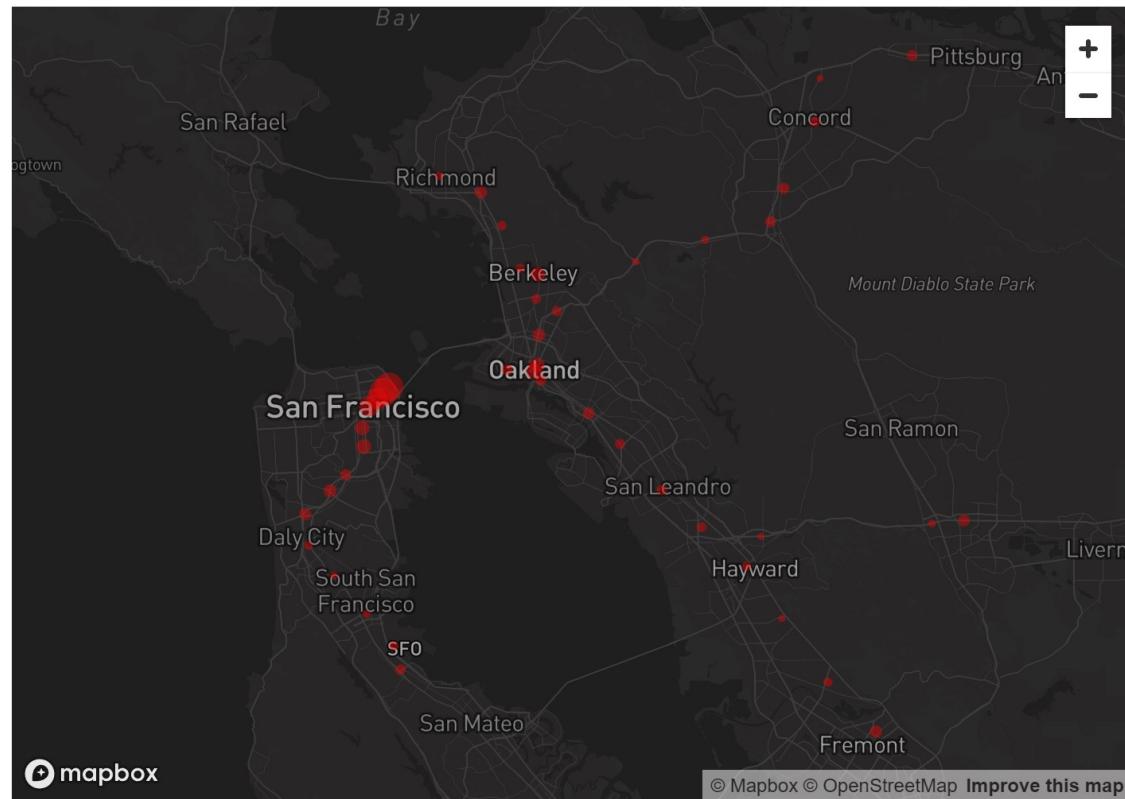
5.00

Color Palette

- Reds
- Blues
- Greens
- Purples
- Oranges

## PyDeck Demo

### Map



	name	code	address	entries	exits
0	Lafayette (LAFY)	LF	3601 Deer Hill Road, Lafayette CA 94549	3,481	3,610
1	12th St. Oakland City Center (12TH)	12	1245 Broadway, Oakland CA 94612	13,418	13,547

# Streamlit + PyDeck (1 of 2)

```
import streamlit as st
import pandas as pd
import pydeck as pdk
import math

# Function to load data
@st.cache_data
def load_data():
    df = pd.read_json("https://raw.githubusercontent.com/visgl/deck.gl-data/master/website/bart-stations.json")
    df[['longitude', 'latitude']] = pd.DataFrame(df['coordinates'].tolist(), index=df.index)
    df["exits_radius"] = df["exits"].apply(lambda exits_count: math.sqrt(exits_count))
    return df

df = load_data()

# Sidebar controls
map_layer_type = st.sidebar.radio('Map Type', ["ScatterplotLayer", "HeatmapLayer"])
map_style = st.sidebar.radio(
    "Map Style",
    [
        "mapbox://styles/mapbox/dark-v11",
        "mapbox://styles/mapbox/light-v11",
        "mapbox://styles/mapbox/streets-v11",
        "mapbox://styles/mapbox/satellite-v9",
    ]
)
opacity = st.sidebar.slider('Opacity', min_value=0.0, max_value=1.0, value=0.5)
radius_scale = st.sidebar.slider('Radius Scale', min_value=1.0, max_value=10.0, value=5.0)
color_choices = st.sidebar.radio('Color Palette', ['Reds', 'Blues', 'Greens', 'Purples', 'Oranges'])

# Color mapping based on choice
color_mapping = {
    "Reds": [255, 0, 0, 140],
    "Blues": [0, 0, 255, 140],
    "Greens": [0, 255, 0, 140],
    "Purples": [128, 0, 128, 140],
    "Oranges": [255, 165, 0, 140]
}
color = color_mapping[color_choices]
```

streamlit\_pydeck\_demo.py

# Streamlit + PyDeck (2 of 2)

```
# Main app
st.title('PyDeck Demo')

# Function to create map
def create_map(dataframe):
    if map_layer_type == "ScatterplotLayer":
        layer = pdk.Layer(
            "ScatterplotLayer",
            dataframe,
            get_position=["longitude", "latitude"],
            get_color=color,
            get_radius="exits_radius",
            radius_scale=radius_scale,
            opacity=opacity,
            pickable=True
        )
    elif map_layer_type == "HeatmapLayer":
        layer = pdk.Layer(
            "HeatmapLayer",
            dataframe,
            get_position=["longitude", "latitude"],
            get_weight="exits",
            opacity=opacity,
            pickable=True
        )
    view_state = pdk.ViewState(
        longitude=dataframe['longitude'].mean(),
        latitude=dataframe['latitude'].mean(),
        zoom=9
    )
    return pdk.Deck(layers=[layer], initial_view_state=view_state, map_style=map_style, tooltip={"text": "{name}\n{address}"})

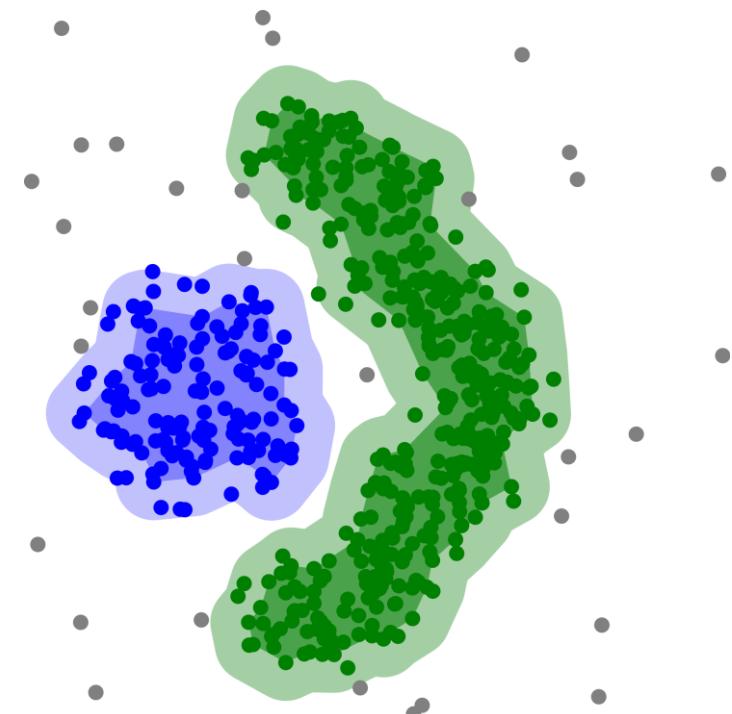
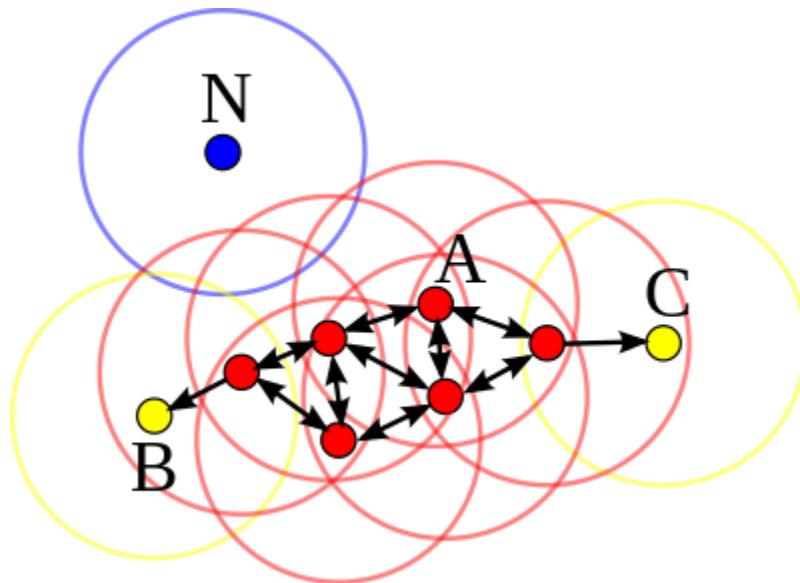
# Display Map
st.write('### Map')
map = create_map(df)
st.pydeck_chart(map)

# Display data
st.dataframe(df)
```

streamlit\_pydeck\_demo.py

# Spatial Analysis Example: DBSCAN

- DBSCAN (Density-Based Spatial Clustering of Applications with Noise)
  - A popular density-based clustering algorithm
  - Given a set of points in some space, it groups together points that are closely packed together (points with many nearby neighbors) and marks them as clusters.
  - Points in low-density regions (whose nearest neighbors are too far away) are marked as noise.



# DBSCAN Algorithm

## 1. Finding the $\epsilon$ (eps) Neighborhood:

- For each point in the dataset, DBSCAN starts by finding all the points within an  $\epsilon$  (epsilon) distance from it. This  $\epsilon$  neighborhood includes the point itself and any point within  $\epsilon$  distance.
- A core point is defined as a point that has at least **minPts (minimum points)** within its  $\epsilon$  neighborhood. This minimum number of points includes the point itself. The idea here is that core points are those that are in dense regions of the data space. The values of  $\epsilon$  and minPts are parameters that need to be specified before running the algorithm and are crucial for the resulting cluster structure.

## 2. Finding Connected Components:

- Once the core points have been identified, DBSCAN then proceeds to form clusters by connecting core points that are neighbors to each other (i.e., within the  $\epsilon$  distance of each other).
- This forms a graph where the core points are vertices, and an edge exists between two core points if they are within  $\epsilon$  distance of each other. Connected components of this graph correspond to individual clusters.
- Non-core points are not yet assigned to any clusters. They are either border points (close to a core point but not enough neighbors to be core themselves) or noise points.

## 3. Assigning Non-Core Points:

- After identifying the clusters based on connected core points, each non-core point is examined. If a non-core point is within  $\epsilon$  distance of any core point of a cluster, it is assigned to that cluster as a border point.
- If a non-core point is not within  $\epsilon$  distance of any core point, it remains as noise, which means it does not belong to any cluster according to the density criteria set by  $\epsilon$  and minPts.

# Traffy Fondu Data

## สำหรับผู้นำข้อมูลไปพัฒนาต่อ�อด

สามารถขอข้อมูลในระบบ เพื่อนำไปจัดทำสถิติหรือ  
วิเคราะห์ข้อมูล ผ่าน API (ข้อมูลจะอัปเดตทุกๆ 10 นาที)

หมายเหตุ : หากดำเนินการนำข้อมูลหรือผลการวิเคราะห์ไปเผยแพร่ต่อ ขอความ  
กรุณา

- แจ้งรายละเอียดของท่าน จุดประสงค์การนำไปใช้งาน สิ่งที่เผยแพร่ผลงาน เมื่อ  
ดาวน์โหลดข้อมูล csv
- ในส่วนผลงานของท่าน กรุณาใส่ลิงค์ traffy.in.th หรือหากเป็นรูปภาพ กรุณาใส่รูป  
โลโก้ของ Traffy Fondu ด้วย เพื่อเป็นการระบุแหล่งข้อมูลต้นทาง และเป็นการให้  
เครดิตกิมพัฒนา Traffy Fondu /ขอบคุณครับ

### การจัดการฐานข้อมูล

เบื้องจากข้อมูลนี้ปริมาณมาก จึงจำกัดจำนวนผลลัพธ์ไว้ ดังนี้

- **หากไม่ระบุตัวตน** ( เช่น กดดาวน์โหลดโดยตรงจากเว็บ bangkok.traffy.in.th  
หรือไม่ได้ส่งค่าตัวแปร name, org, ฯลฯ มา ) จะถูกจำกัด limit ไว้ไม่เกิน 1,000  
รายการ
- **หากระบุตัวตน** ( ส่งค่าตัวแปร name, org, ฯลฯ มา ) จะถูกจำกัด limit ไว้ไม่เกิน  
25,000 รายการ
- **หากต้องการข้อมูลทั้งหมด** สามารถดาวน์โหลดได้ที่ลิงค์ด้านล่างนี้ ( ประมาณ  
300MB ) โดยข้อมูลจะอัปเดตทุกๆ 3:00 น. ของทุกวัน  
[https://publicapi.traffy.in.th/dump-csv-chadchart/bangkok\\_traffy.csv](https://publicapi.traffy.in.th/dump-csv-chadchart/bangkok_traffy.csv)

### Resource URL

**JSON format** ( อัปเดตทุกๆ 10 นาที )

[https://publicapi.traffy.in.th/teamchadchart-stat-api/geojson/v1?  
output\\_format=json](https://publicapi.traffy.in.th/teamchadchart-stat-api/geojson/v1?output_format=json)

**CSV format** ( อัปเดตทุกๆ 10 นาที )

[https://publicapi.traffy.in.th/teamchadchart-stat-api/geojson/v1?  
output\\_format=csv](https://publicapi.traffy.in.th/teamchadchart-stat-api/geojson/v1?output_format=csv)

[https://www.traffy.in.th/?page\\_id=27351](https://www.traffy.in.th/?page_id=27351)

## ข้อมูลล่าสุด ( อัปเดตทุกๆ 10 นาที )

- หากไม่ระบุตัวตน limit ไม่เกิน 1000 รายการ

[https://publicapi.traffy.in.th/teamchadchart-stat-api/geojson/v1?  
output\\_format=json](https://publicapi.traffy.in.th/teamchadchart-stat-api/geojson/v1?output_format=json)

- หากระบุตัวตน limit ไม่เกิน 25,000 รายการ

[https://publicapi.traffy.in.th/teamchadchart-stat-api/geojson/v1?  
output\\_format=csv&limit=2000&name=test&org=test&purpose=test&email=test@test.org](https://publicapi.traffy.in.th/teamchadchart-stat-api/geojson/v1?output_format=csv&limit=2000&name=test&org=test&purpose=test&email=test@test.org)

[https://publicapi.traffy.in.th/teamchadchart-stat-api/geojson/v1?  
output\\_format=csv&name=a&org=a&purpose=a&email=a@a.com&limit=10000&text=นำทัวร์&start=2023-05-01&end=2023-10-31](https://publicapi.traffy.in.th/teamchadchart-stat-api/geojson/v1?output_format=csv&name=a&org=a&purpose=a&email=a@a.com&limit=10000&text=นำทัวร์&start=2023-05-01&end=2023-10-31)

## ข้อมูลทั้งหมด ( อัปเดตทุกๆ 3:00 น. ของทุกวัน )

( ขนาดประมาณ 500MB เมื่อเดือน พ.ย. 2566 )

[https://publicapi.traffy.in.th/dump-csv-chadchart/bangkok\\_traffy.csv](https://publicapi.traffy.in.th/dump-csv-chadchart/bangkok_traffy.csv)

# Traffy Fondue: Flood

[https://publicapi.traffy.in.th/teamchadchart-stat-api/geojson/v1?output\\_format=csv&name=a&org=a&purpose=a&email=a@a.com&limit=10000&text=น้ำท่วม&start=2023-05-01&end=2023-10-31](https://publicapi.traffy.in.th/teamchadchart-stat-api/geojson/v1?output_format=csv&name=a&org=a&purpose=a&email=a@a.com&limit=10000&text=น้ำท่วม&start=2023-05-01&end=2023-10-31)

traffy\_flood.csv

ticket_id	type	organization	organization_ac	comment	coords	photo	photo_after	address	subdistrict	district	province	timestamp
2024-B2ZLKK	น้ำท่วม	กรุงเทพมหานคร,	เขตจตุจักร,	ฝูงน้ำคลองมาใช้เล่นสาด	100.46373,13.69901	<a href="https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/2024-B2ZLKK.jpg">https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/2024-B2ZLKK.jpg</a>	<a href="https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/2024-B2ZLKK_after.jpg">https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/2024-B2ZLKK_after.jpg</a>	89/3 ถ. เอกบานงขุนเทีย	จอมทอง	กรุงเทพมหานคร	4/14/2024 21:12	
2024-FTC3WN	น้ำท่วม	กรุงเทพมหานคร,	เขตคลองสาน	น้ำขังจากข้างบ้าน ความสูง	100.73738,13.90355	<a href="https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/2024-FTC3WN.jpg">https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/2024-FTC3WN.jpg</a>	<a href="https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/2024-FTC3WN_after.jpg">https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/2024-FTC3WN_after.jpg</a>	98 ซอย นิว สามาดาลวั	คลองสาน	กรุงเทพมหานคร	4/14/2024 9:22	
7C7B97	น้ำท่วม	ร้องทุกษ์ กทม.	15 ฝ่ายโยธา เขตด	พวนน้ำท่วมขังเนื่องจากน้ำ	100.4877,13.72751	<a href="https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/7C7B97.jpg">https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/7C7B97.jpg</a>	<a href="https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/7C7B97_after.jpg">https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/7C7B97_after.jpg</a>	PFGQ+X35 หัวหมูรัช	ธนบุรี	กรุงเทพมหานคร	4/14/2024 8:57	
2024-AYETBW	ถนน	พรrocก้าวไกล	ดอฝ่ายโยธา เขตด	ช.สركแคมป์ 25 แยก 2-5 ในมี	100.59554,13.93467	<a href="https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/2024-AYETBW.jpg">https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/2024-AYETBW.jpg</a>	<a href="https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/2024-AYETBW_after.jpg">https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/2024-AYETBW_after.jpg</a>	1606 ซอย สีกัน	ดอนเมือง	กรุงเทพมหานคร	4/13/2024 19:27	
2024-AWTL8U	น้ำท่วม	กรุงเทพมหานคร,	กองระบบคลอง	จัดคนมาขุดลอกคลองเสียบ	100.59076,13.93169	<a href="https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/2024-AWTL8U.jpg">https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/2024-AWTL8U.jpg</a>	<a href="https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/2024-AWTL8U_after.jpg">https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/2024-AWTL8U_after.jpg</a>	310/1333 ซอย สีกัน	ดอนเมือง	กรุงเทพมหานคร	4/13/2024 12:26	
2024-4HQ6W9	น้ำท่วม	กรุงเทพมหานคร,	เขตบางซื่อ,	ฝ่ายเพื่อนบ้านติดรถง่า	100.51005,13.82232	<a href="https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/2024-4HQ6W9.jpg">https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/2024-4HQ6W9.jpg</a>	<a href="https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/2024-4HQ6W9_after.jpg">https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/2024-4HQ6W9_after.jpg</a>	1564/4 ก. ทางส์สว่าง	บางซื่อ	กรุงเทพมหานคร	4/13/2024 7:17	
UH2W2K	น้ำท่วม	ร้องทุกษ์ กทม.	15 ฝ่ายโยธา เขตด	ปั๊มน้ำ: ภายในซอยแยก	100.5323,13.70121	<a href="https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/UH2W2K.jpg">https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/UH2W2K.jpg</a>	<a href="https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/UH2W2K_after.jpg">https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/UH2W2K_after.jpg</a>	21/29 กบ ปั่นนนทรี	ยานนาวา	กรุงเทพมหานคร	4/12/2024 13:37	
2024-C6D7LN	ทางเท้า	กรุงเทพมหานคร,	ฝ่ายโยธา เขตด	เส้นทางเดินเท้า หลังจากมีก	100.36757,13.73007	<a href="https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/2024-C6D7LN.jpg">https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/2024-C6D7LN.jpg</a>	<a href="https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/2024-C6D7LN_after.jpg">https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/2024-C6D7LN_after.jpg</a>	86 ช. อัสสัน บางไผ่	บางแค	กรุงเทพมหานคร	4/12/2024 7:55	
2024-6X94YU	น้ำท่วม	กรุงเทพมหานคร,	เขตบางซื่อ,	ฝ่ายขอทราบผลการดำเนินการเริ่	100.53244,13.82019	<a href="https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/2024-6X94YU.jpg">https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/2024-6X94YU.jpg</a>	<a href="https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/2024-6X94YU_after.jpg">https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/2024-6X94YU_after.jpg</a>	229/5 ซอย บางซื่อ	บางซื่อ	กรุงเทพมหานคร	4/11/2024 22:49	
H3N3T2	น้ำท่วม	ร้องทุกษ์ กทม.	15 เขตบางพลัด,	ภ.มีน้ำท่วมสูงประมาณ 25	100.49159,13.76554	<a href="https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/H3N3T2.jpg">https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/H3N3T2.jpg</a>	<a href="https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/H3N3T2_after.jpg">https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/H3N3T2_after.jpg</a>	264 ก. อรุณ บางปี้ขัน	บางพลัด	กรุงเทพมหานคร	4/11/2024 22:25	
2024-33F7AK	น้ำท่วม	กรุงเทพมหานคร,	ฝ่ายโยธา เขตด	วังแจ้งร้องเรียนครับ อวยาให้	100.6143,13.77133	<a href="https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/2024-33F7AK.jpg">https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/2024-33F7AK.jpg</a>	<a href="https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/2024-33F7AK_after.jpg">https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/2024-33F7AK_after.jpg</a>	94 ซอย ลา พลับพลา	วังทองหลาง	กรุงเทพมหานคร	4/11/2024 18:47	
2024-A29D8H	น้ำท่วม	ก้าวไกล	คลองสาน ฝ่ายโยธา เขตด	น้ำท่วมขังนานเป็นระยะเวลา	100.69867,13.84137	<a href="https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/2024-A29D8H.jpg">https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/2024-A29D8H.jpg</a>	<a href="https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/2024-A29D8H_after.jpg">https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/2024-A29D8H_after.jpg</a>	RMRX+HFM บางชัน	คลองสาน	กรุงเทพมหานคร	4/11/2024 16:49	
2024-479QTP	น้ำท่วม	กรุงเทพมหานคร,	เขตดัจกร,	ฝ่ายในซอยริวาร์ดีรังสิต 20 เช่า	100.56203,13.80325	<a href="https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/2024-479QTP.jpg">https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/2024-479QTP.jpg</a>	<a href="https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/2024-479QTP_after.jpg">https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/2024-479QTP_after.jpg</a>	RH36+8V4 จอมพล	จต.รังสิต	กรุงเทพมหานคร	4/11/2024 13:31	
2024-7DBX9L	น้ำท่วม	กรุงเทพมหานคร,	เขตบางกอกน้อย	ขอความอนุเคราะห์ เขตบาง	100.47663,13.75166	<a href="https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/2024-7DBX9L.jpg">https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/2024-7DBX9L.jpg</a>	<a href="https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/2024-7DBX9L_after.jpg">https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/2024-7DBX9L_after.jpg</a>	15/7 ช. วิส บ้านช่างหล	บางกอกน้อย	กรุงเทพมหานคร	4/11/2024 8:13	
YTN9VM	น้ำท่วม	ร้องทุกษ์ กทม.	15 เขตบางกอกน้อย	เครื่องสูบน้ำแล้วไม่มีการ	100.47712,13.77371	<a href="https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/YTN9VM.jpg">https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/YTN9VM.jpg</a>	<a href="https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/YTN9VM_after.jpg">https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/YTN9VM_after.jpg</a>	เลขที่ 197 อรุณอมรินทร์	บางกอกน้อย	กรุงเทพมหานคร	4/11/2024 6:41	
2024-CBQHYP	จดเสียง, คำเพื่อนชี้ชาติ,	เขตเดส่วนกลาง,	สบสีวีโภเนื้อทุกเช้า จำ	มีน้ำเน่าท	100.63015,13.73615	<a href="https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/2024-CBQHYP.jpg">https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/2024-CBQHYP.jpg</a>	<a href="https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/2024-CBQHYP_after.jpg">https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/2024-CBQHYP_after.jpg</a>	PJPH+CW6 สวนหลวง	สวนหลวง	กรุงเทพมหานคร	4/10/2024 22:49	
2024-D3MGDG	ความสะอาด	กรุงเทพมหานคร,	ฝ่ายสิ่งแวดล้อม	ห้องน้ำห้องส้วมแคมป์คัน	100.3361,13.785	<a href="https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/2024-D3MGDG.jpg">https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/2024-D3MGDG.jpg</a>	<a href="https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/2024-D3MGDG_after.jpg">https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/2024-D3MGDG_after.jpg</a>	18/19 ซอย ศาลาธรรมสพท	ศาลาธรรมสพท	กรุงเทพมหานคร	4/10/2024 18:07	
2024-DU23ML	น้ำท่วม	กรุงเทพมหานคร,	ฝ่ายโยธา เขตด	อยากให้เจ้าหน้าที่ช่วยเช้าน	100.52588,13.78975	<a href="https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/2024-DU23ML.jpg">https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/2024-DU23ML.jpg</a>	<a href="https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/2024-DU23ML_after.jpg">https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/2024-DU23ML_after.jpg</a>	158/2 ซอย ถนนนครไชยศิล	ถนนนครไชยศิล	กรุงเทพมหานคร	4/10/2024 17:14	
7HTCKN	เส้นอแนก,	ร้องทุกษ์ กทม.	15 เขตพระนคร,	กร.พื้นผิวน้ำท่วม 50 เขต ของ	100.50182,13.75391	<a href="https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/7HTCKN.jpg">https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/7HTCKN.jpg</a>	<a href="https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/7HTCKN_after.jpg">https://storage.googleapis.com/traffy-publicapi/2024/05/01/2023-05-01_2023-10-31/traffy_flood/7HTCKN_after.jpg</a>	173 ถนน ต. เสาชิงข้าว	พระนคร	กรุงเทพมหานคร	4/10/2024 15:20	

Split this column into  
longitude and latitude

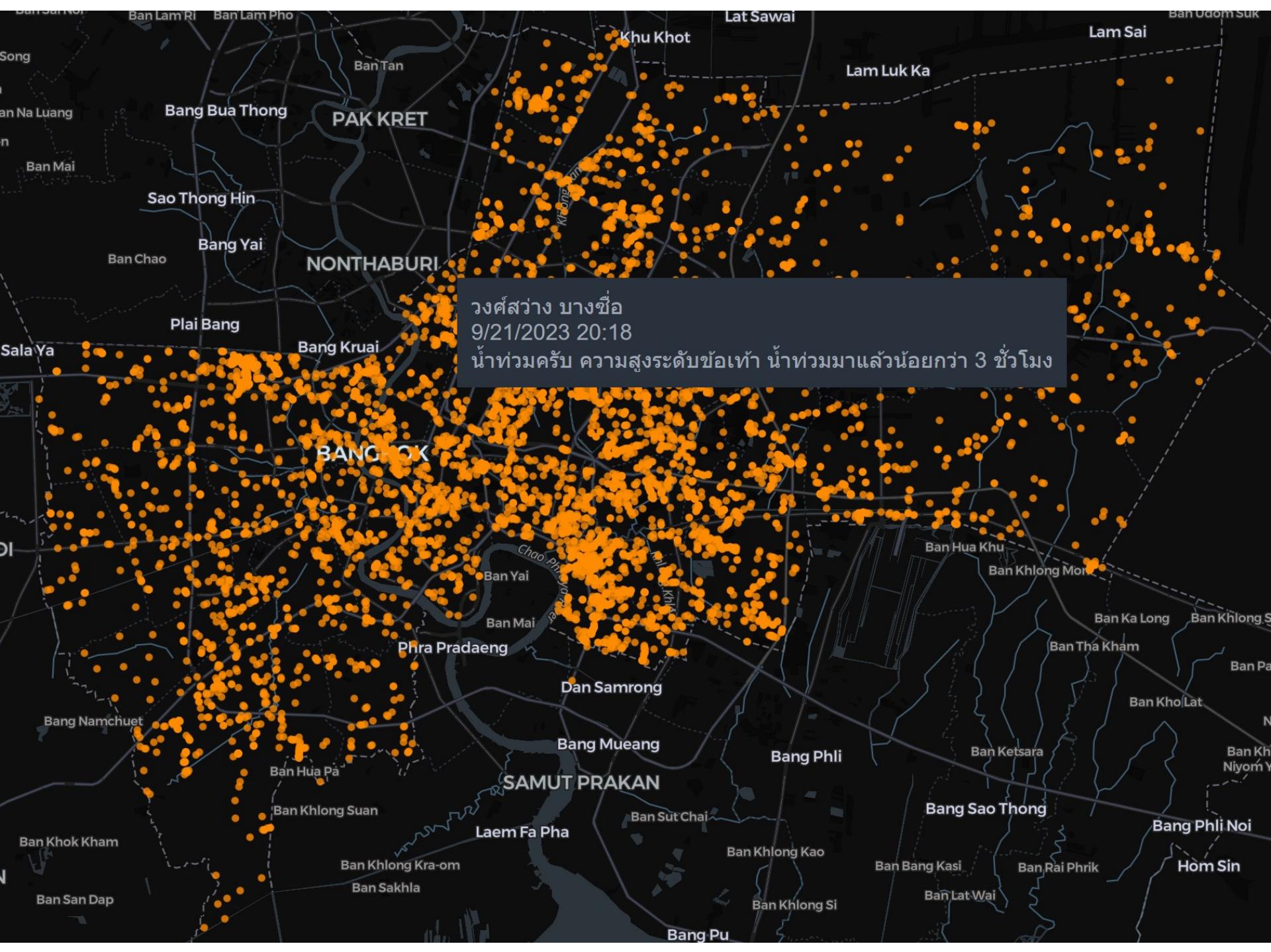
# Traffy Fondu: Flood: Scatter Plot

```
# Define a layer to display on a map
layer = pdk.Layer(
    "ScatterplotLayer",
    df,
    get_position=["longitude", "latitude"],
    get_radius=200,
    get_fill_color=[255, 140, 0],
    opacity=0.6,
    pickable=True
)

# Set the viewport location
view_state = pdk.data_utils.compute_view(df[["longitude", "latitude"]])
view_state.zoom = 10

# Render
deck = pdk.Deck(layers=[layer], initial_view_state=view_state,
                 tooltip={"text": "{subdistrict} {district}\n{timestamp}\n{comment}"})
deck.to_html("pydeck_traffy.html")
```

traffy\_flood.ipynb



# Traffy Fondu: Flood: DBSCAN

```
# DBSCAN clustering
from sklearn.cluster import DBSCAN

coords = df[['latitude', 'longitude']]
db = DBSCAN(eps=0.005, min_samples=10).fit(coords)
df['cluster'] = db.labels_

# Filter out noise points
df = df[df['cluster'] != -1]

# Count the number of points in each cluster
clusters_count = df['cluster'].value_counts()

# Exclude the '-1' cluster, which represents noise
clusters_count = clusters_count[clusters_count.index != -1]

unique_clusters = df['cluster'].unique()
num_clusters = len(unique_clusters)

# Use a continuous colormap to generate colors, ensure we have enough colors for all clusters.
colormap = plt.get_cmap('hsv')
cluster_colors = {cluster: [int(x*255) for x in colormap(i/num_clusters)[:3]]
                  for i, cluster in enumerate(unique_clusters)}

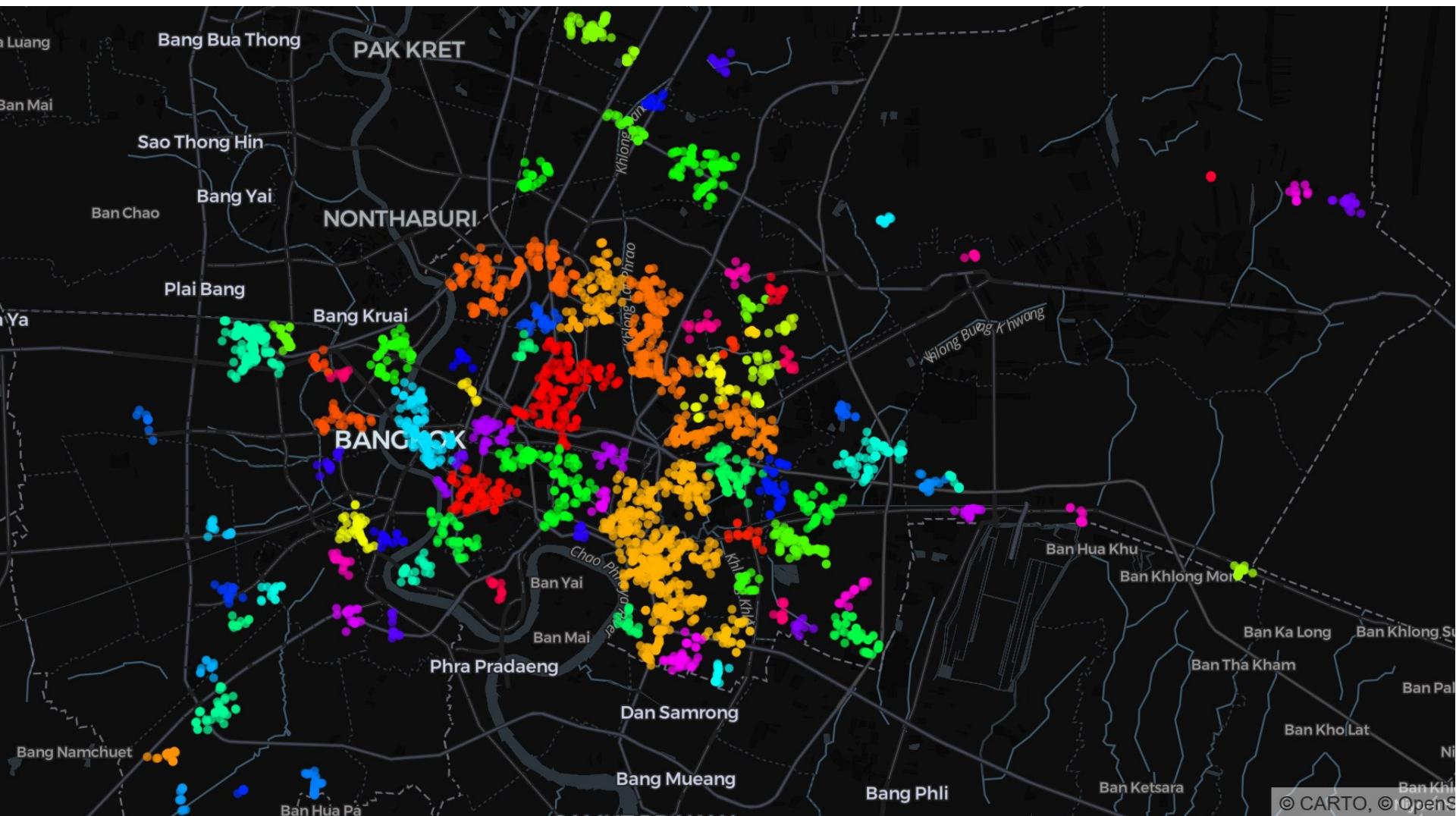
# Map cluster ID to color for each row in the dataframe
df['color'] = df['cluster'].map(cluster_colors)

# Define the scatter plot layer
scatter_layer = pdk.Layer(
    "ScatterplotLayer",
    df,
    get_position="[longitude, latitude]",
    get_color='color',
    get_radius=200,
    opacity=0.5,
    pickable=True
)

view_state = pdk.ViewState(
    latitude=df['latitude'].mean(),
    longitude=df['longitude'].mean(),
    zoom=10
)
pdk.Deck(layers=[scatter_layer], initial_view_state=view_state, tooltip={"text": "{cluster}\n{subdistrict}\n{district}\n{timestamp}"}))
```

traffy\_flood.ipynb

# Traffy Fondu: Flood: DBSCAN



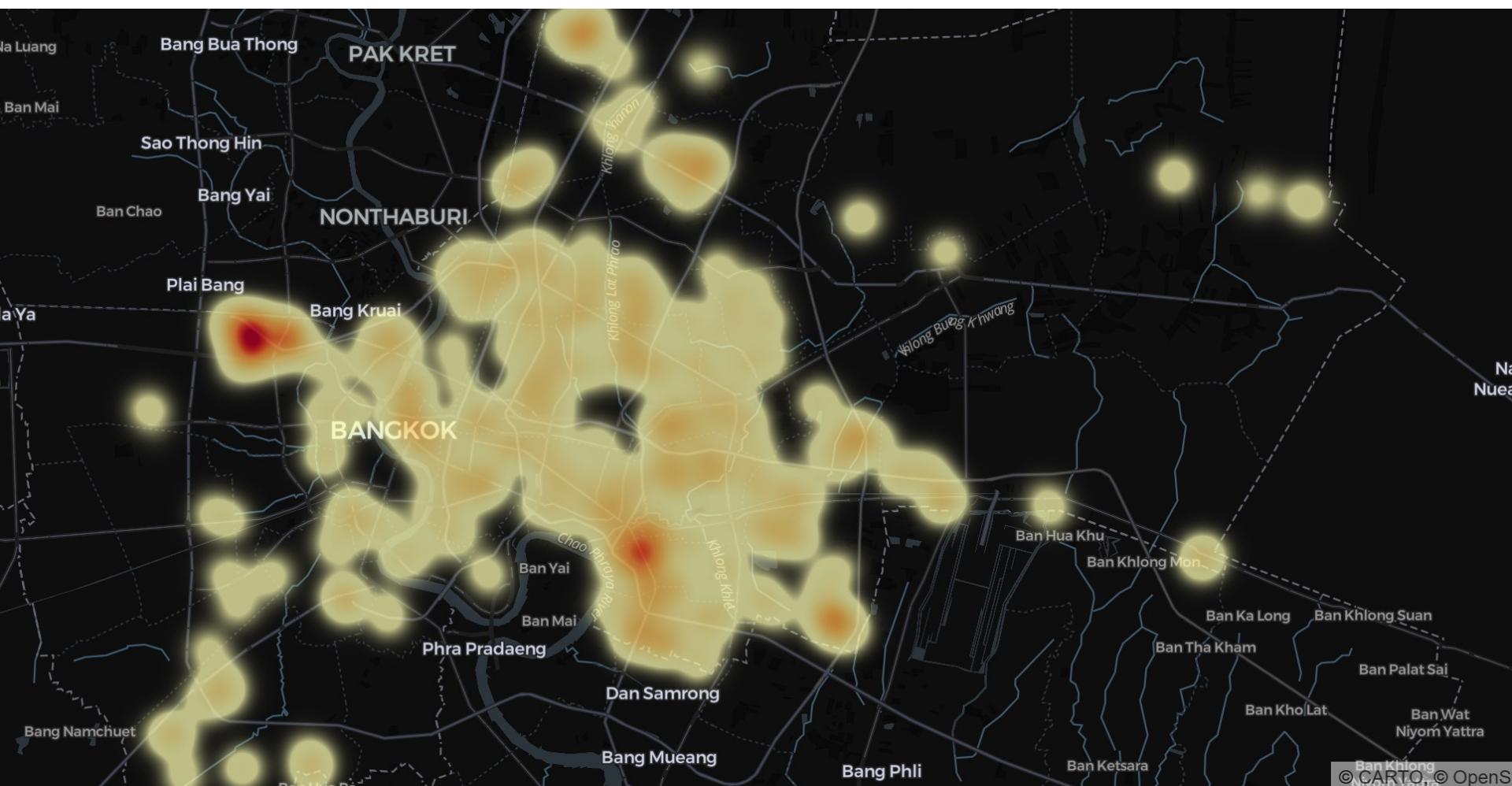
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```
# Define the heatmap layer
heatmap_layer = pdk.Layer(
    "HeatmapLayer",
    df,
    get_position="[longitude, latitude]",
    opacity=0.5,
    pickable=True
)

view_state = pdk.ViewState(
    latitude=df['latitude'].mean(),
    longitude=df['longitude'].mean(),
    zoom=10
)
pdk.Deck(layers=[heatmap_layer], initial_view_state=view_state)
```

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```
import matplotlib.pyplot as plt

# Plotting the data
clusters_count.plot(kind='bar', color='blue') # You can customize the color

plt.xticks(fontsize=8)

# Optional: adjust figure size if labels still overlap
plt.gcf().set_size_inches(12, 6) # Adjust the size as needed

plt.xlabel('Cluster') # Set x-axis label, if needed
plt.ylabel('Count') # Set y-axis label
plt.title('Size of Clusters') # Set title
plt.show()
```

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