TIGER CORRIDOR DETECTION

An anti poaching effort

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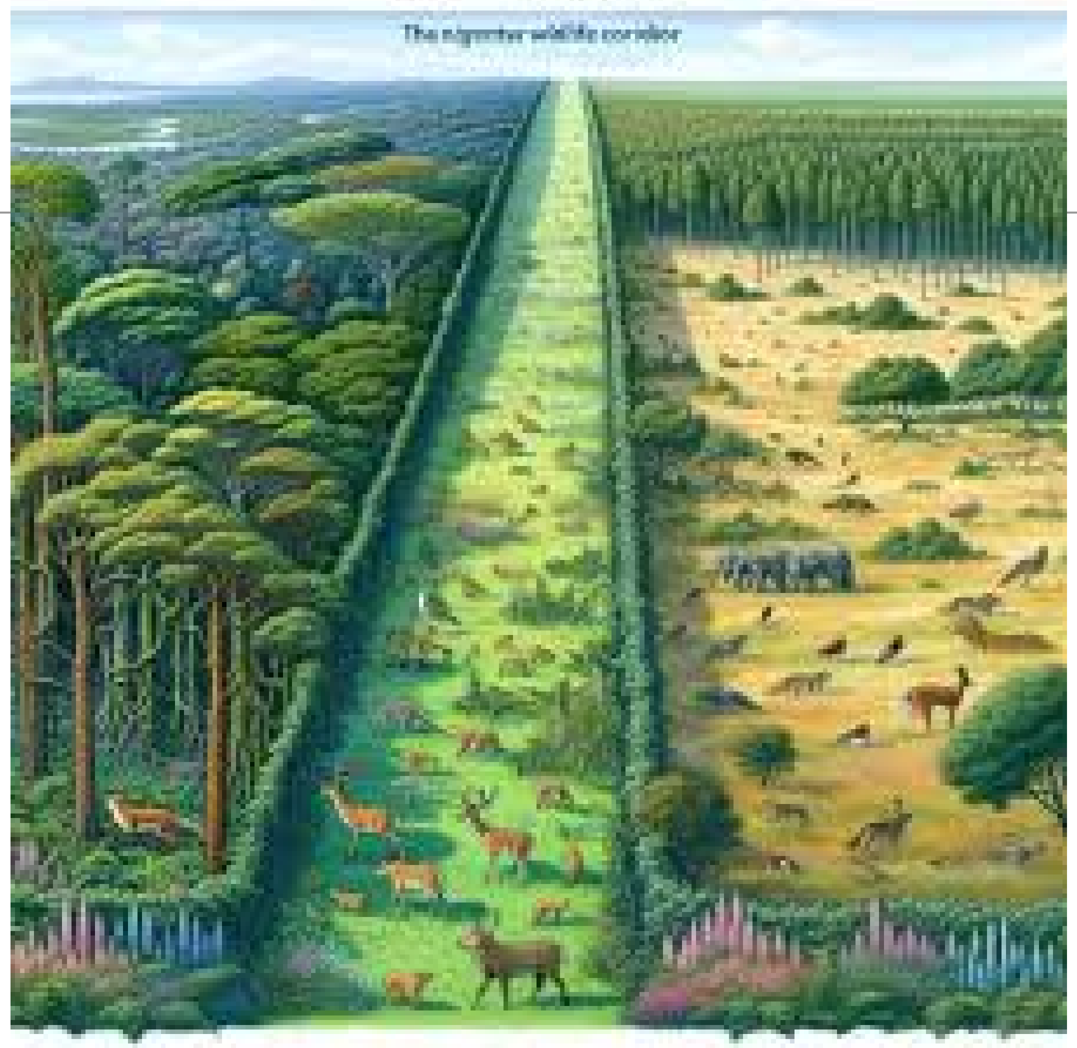
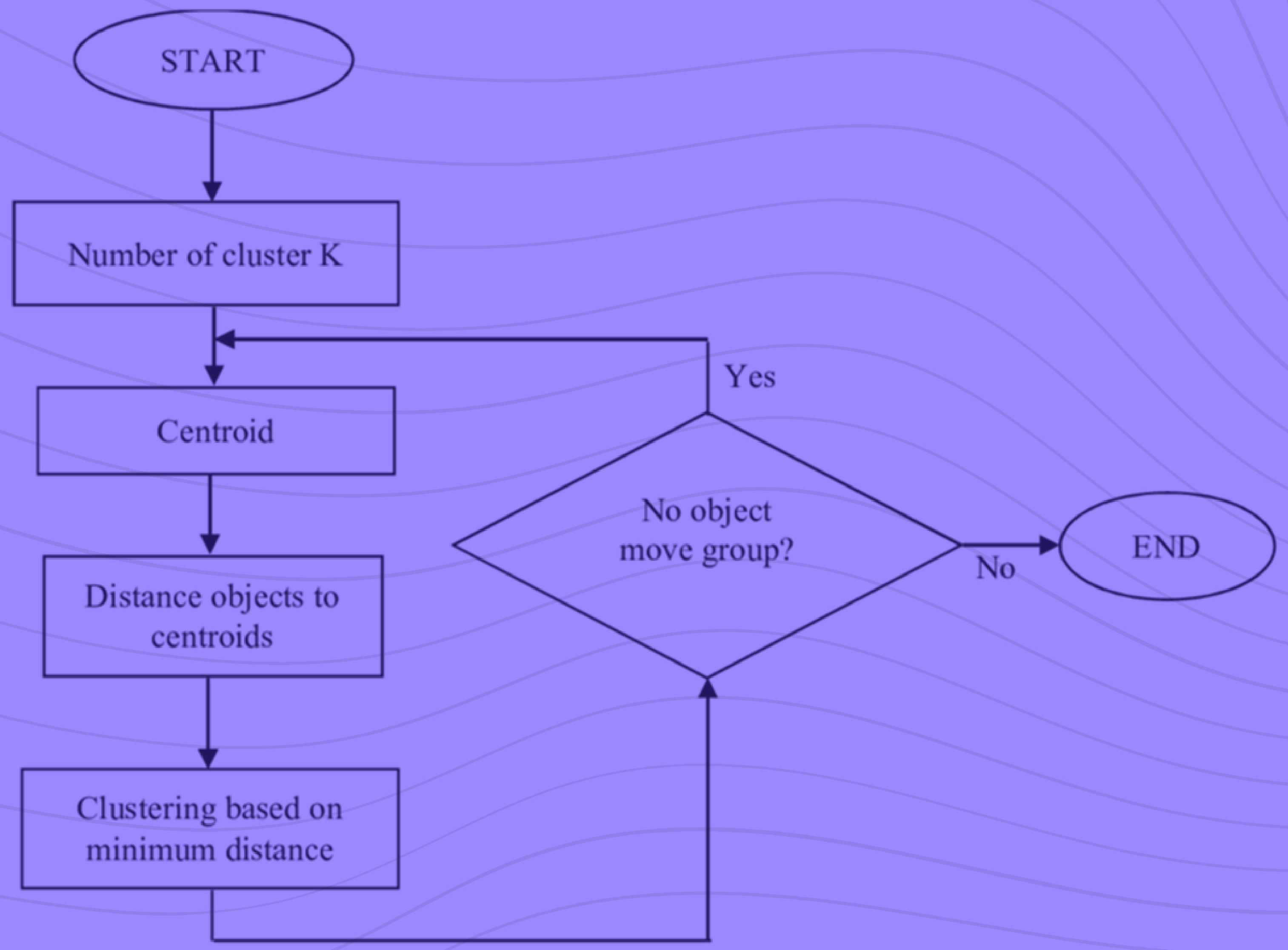
What are Corridors?

Wildlife corridors are natural pathways that connect fragmented habitats, allowing animals to move safely between areas for breeding, foraging, or migration. They help maintain genetic diversity and access to resources, while also mitigating the effects of human-induced habitat fragmentation. For tigers, these corridors are crucial for ensuring population connectivity and reducing human-wildlife conflicts, playing a vital role in conservation efforts.



What is K-Means

- A popular and simple clustering algorithm.
- Partitions data into K clusters by minimizing intra-cluster distance.



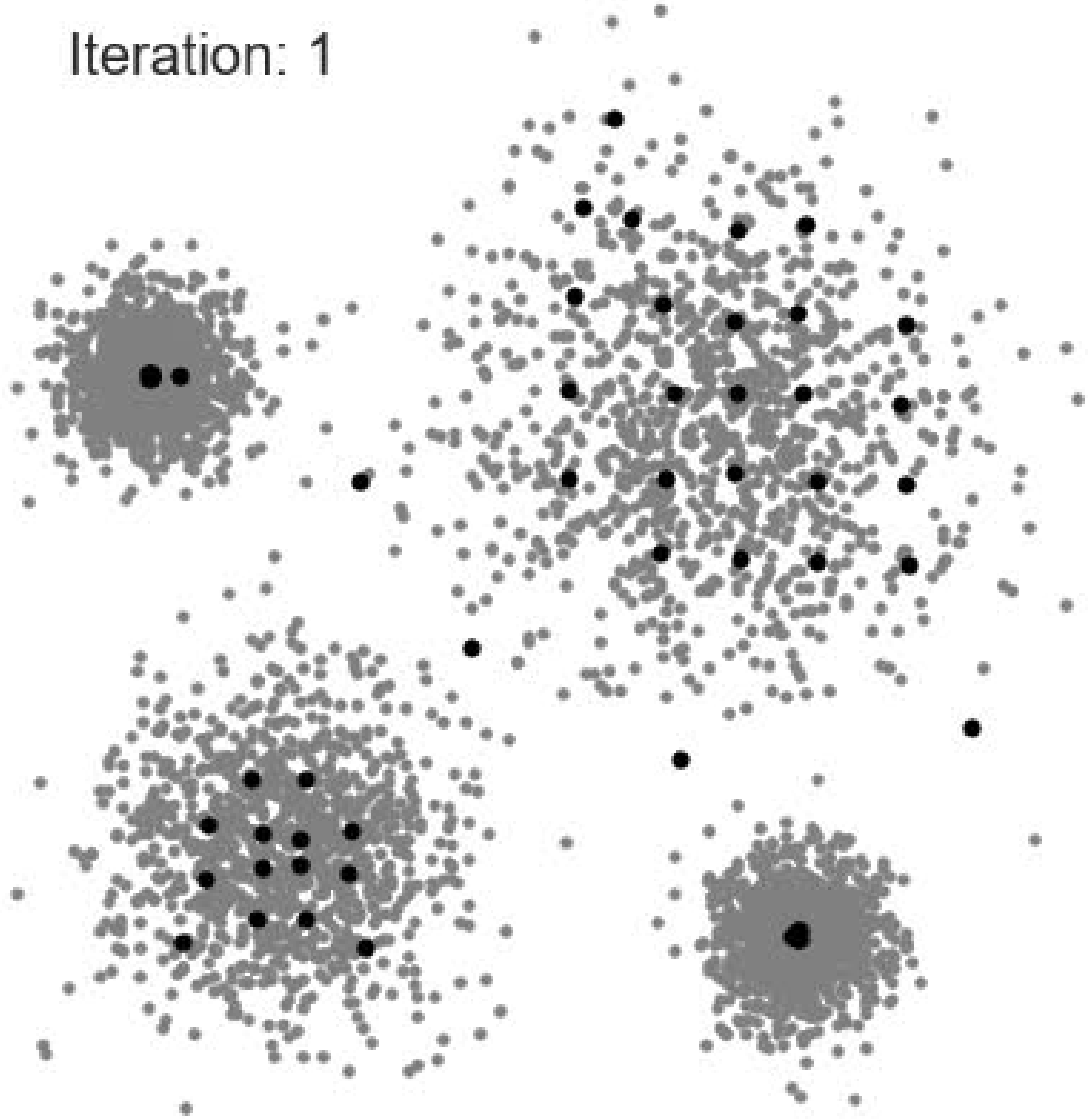
K-Means
in 4 Simple Steps

Initialization: Select K initial centroids.

Assignment: Assign each point to the nearest centroid.

Update: Compute new centroids by averaging points in each cluster.

Convergence: Repeat until centroids stabilize.

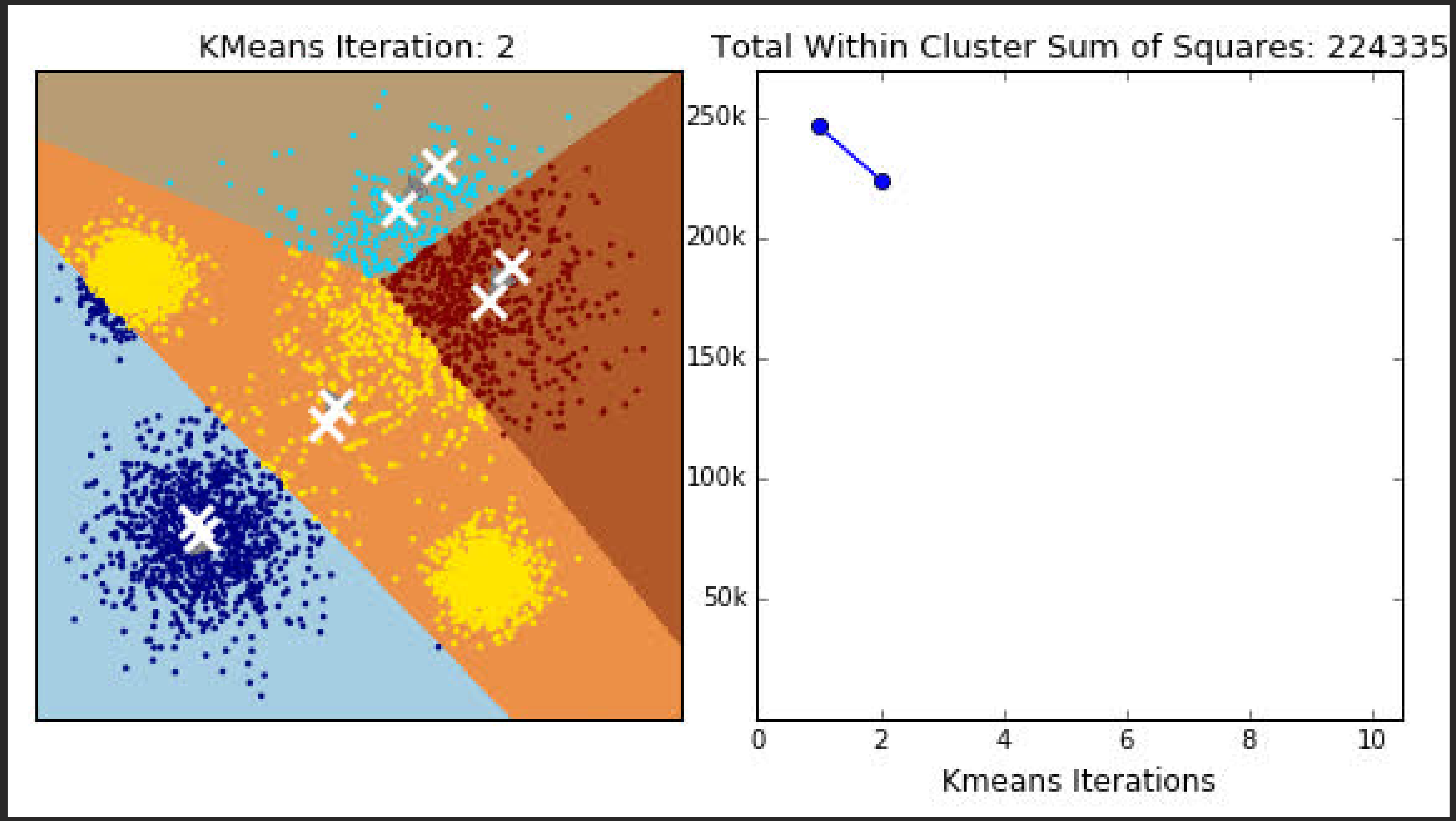


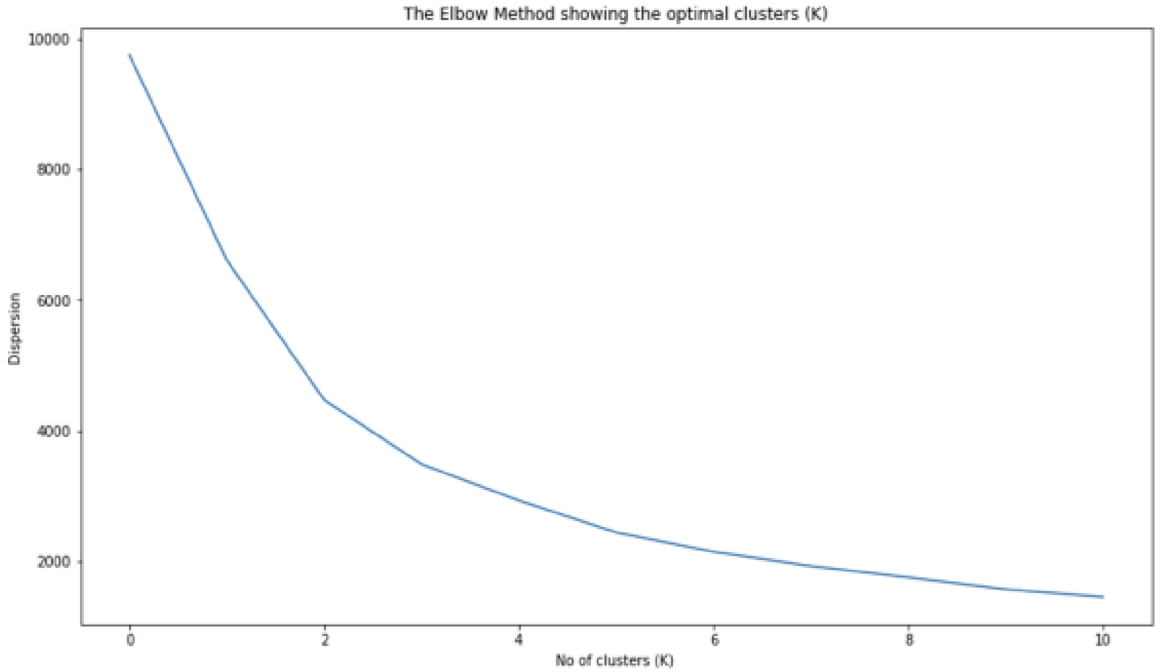
Objective: Minimizing WCSS

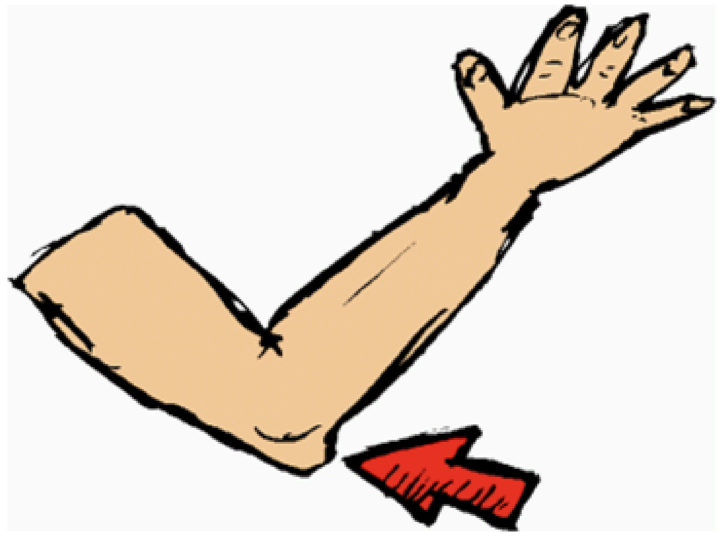
WCSS (WITHIN-CLUSTER SUM OF SQUARES): MEASURES COMPACTNESS OF CLUSTERS.

OBJECTIVE: MINIMIZE THE SUM OF SQUARED DISTANCES BETWEEN POINTS AND CENTROIDS.

Formula: $\mathrm{WCSS} = \sum_{k=1}^{K} \sum_{x_i \in C_k} \|x_i - \mu_k\|^2$







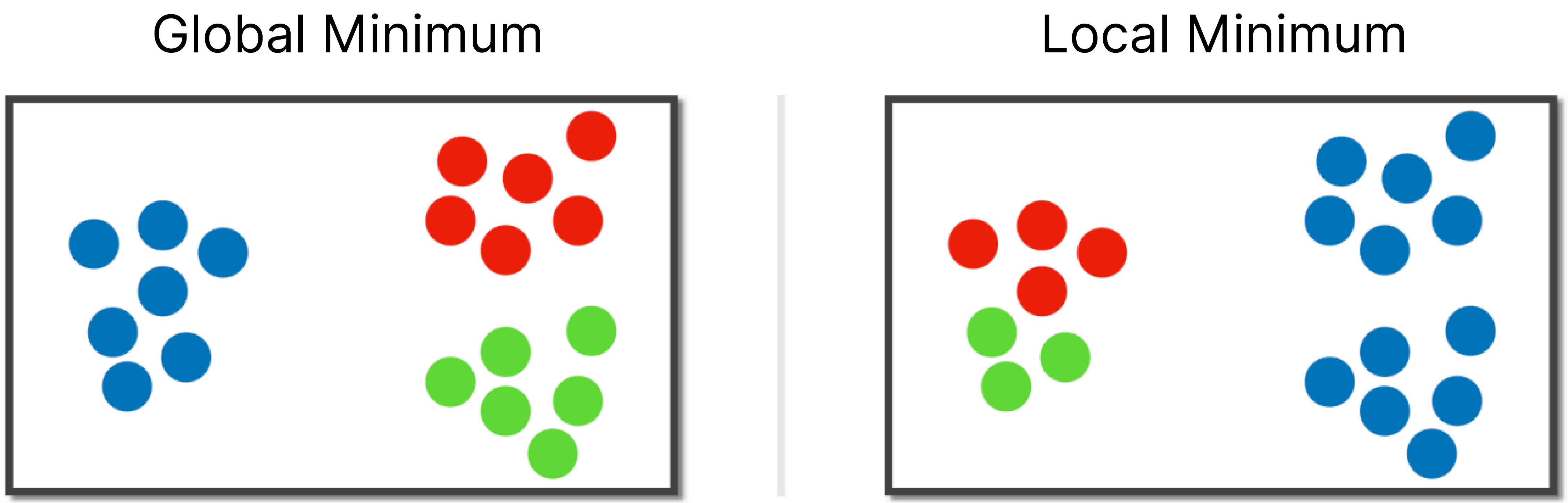
HOW K-MEANS OPTIMIZES

- Greedy Approach: Iteratively reduces WCSS.
- Convergence: Guaranteed to reach a local minimum.

Challenges in K-Means

CHOOSING THE NUMBER OF CLUSTERS(K)

SENSITIVE TO OUTLIERS AND FEATURE SCALING.

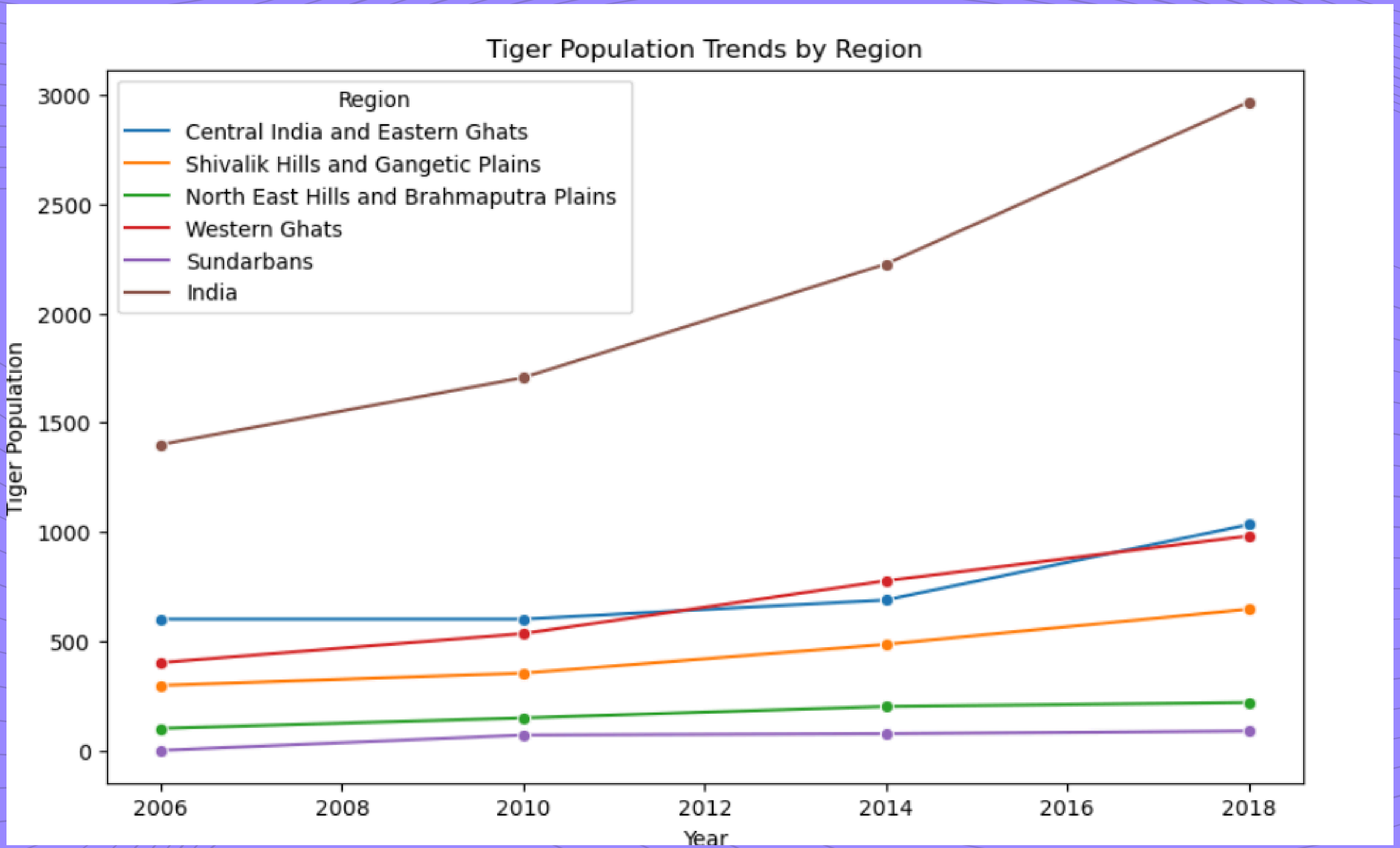


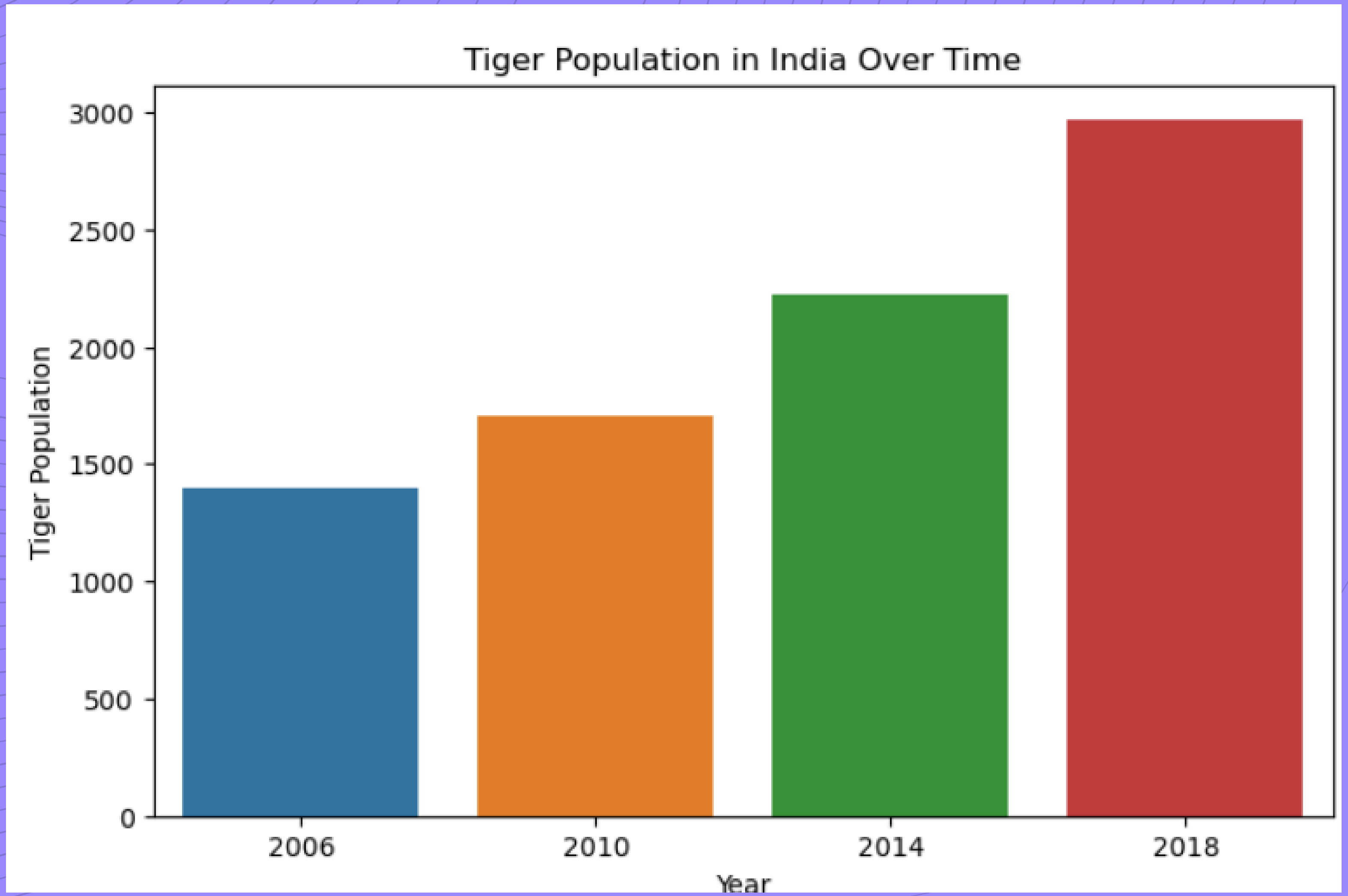
Dataset

Year	Region	Tigers
2006	Central India and Eastern Ghats	601
2010	Central India and Eastern Ghats	601
2014	Central India and Eastern Ghats	688
2018	Central India and Eastern Ghats	1033
2006	Shivalik Hills and Gangetic Plains	297
2010	Shivalik Hills and Gangetic Plains	353
2014	Shivalik Hills and Gangetic Plains	485
2018	Shivalik Hills and Gangetic Plains	646
2006	orth East Hills and Brahmaputra Plain	100
2010	orth East Hills and Brahmaputra Plain	148
2014	orth East Hills and Brahmaputra Plain	201
2018	orth East Hills and Brahmaputra Plain	219
2006	Western Ghats	402
2010	Western Ghats	534
2014	Western Ghats	776
2018	Western Ghats	981
2006	Sundarbans	0
2010	Sundarbans	70
2014	Sundarbans	76
2018	Sundarbans	88
2006	India	1400
2010	India	1706
2014	India	2226
2018	India	2967

The tiger dataset was compiled from a variety of credible sources, ensuring diverse and high-quality data for analysis. It includes satellite imagery, field survey data, and photographic evidence from camera traps, capturing tiger movements and habitat patterns. Additionally, conservation organizations provided wildlife corridor maps, while governmental and non-governmental reports contributed population statistics and geographical details. This dataset serves as a comprehensive resource for understanding tiger behavior, habitat utilization, and threats such as poaching and habitat encroachment, offering valuable insights for wildlife conservation and ecological studies.

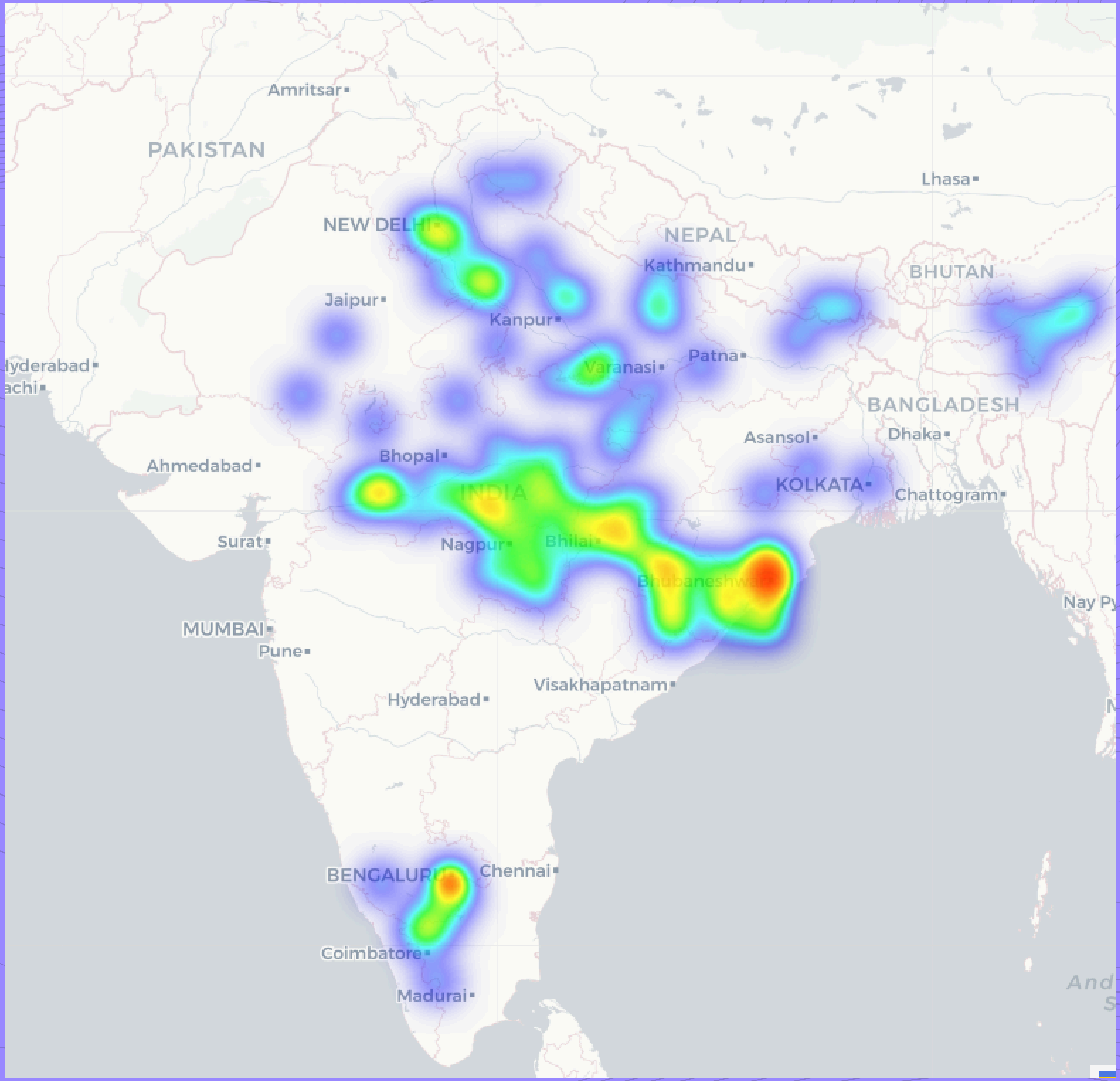
INITIAL ANALYSIS






```
Predicted tiger population for 2022: 1126
Predicted tiger population for 2025: 1257
Predicted tiger population for 2030: 1474
```

Results



Heatmap of Tiger Poaching Activities in India

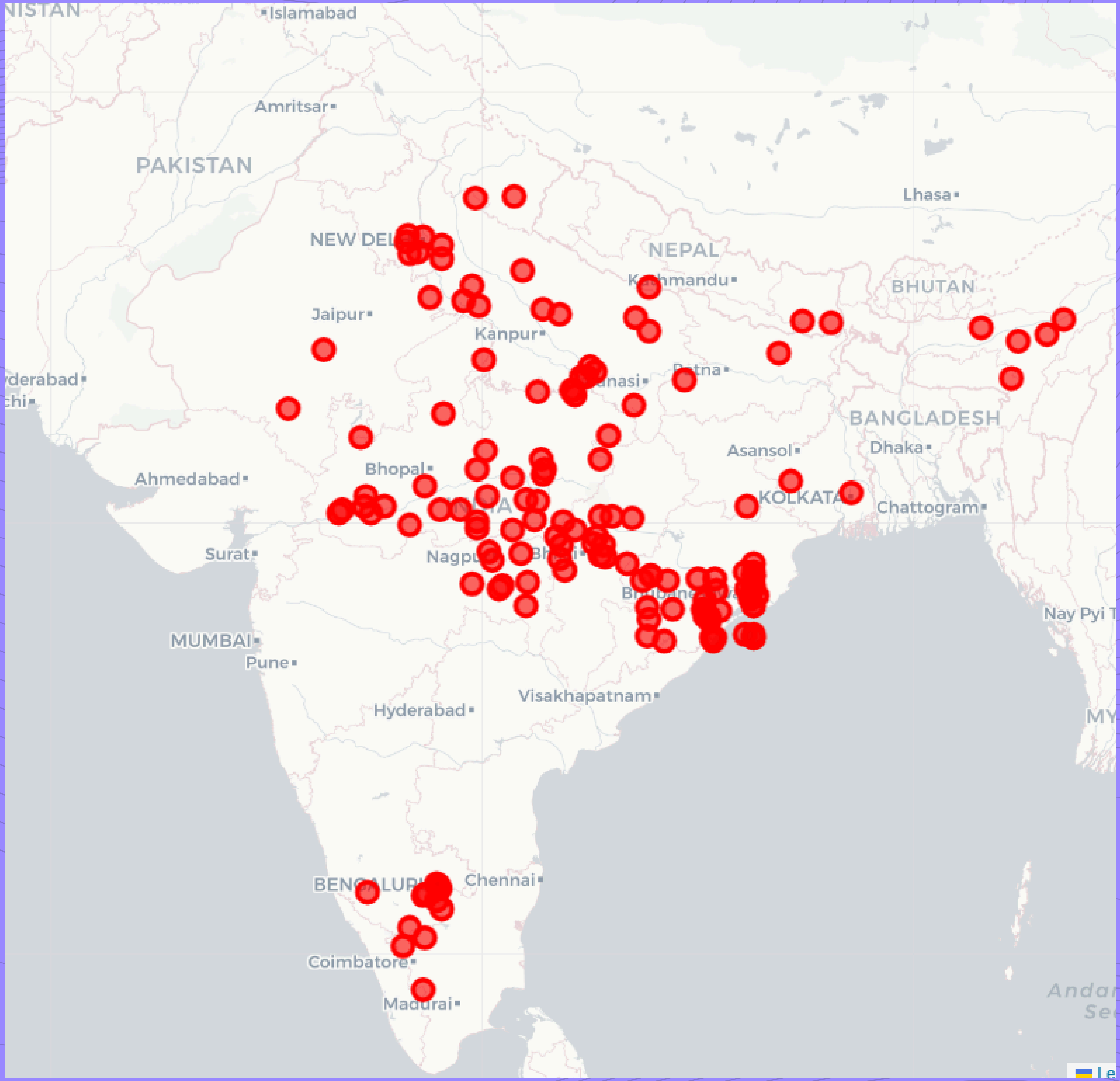
```python
# Prepare heatmap data for poaching incidents
poaching_heatmap_data = [[row['Lat'], row['Lon']] for index, row in poaching_data.iterrows()]

# Create a base map using Folium
m = folium.Map(location=[23.5937, 80.9629], zoom_start=5, tiles='CartoDB positron')

# Create a heatmap layer for poaching incidents
HeatMap(poaching_heatmap_data, radius=15, max_zoom=13).add_to(m)

# Display the map and save it as an HTML file
m.save('poaching_heatmap.html')
m
```

Code Snippet



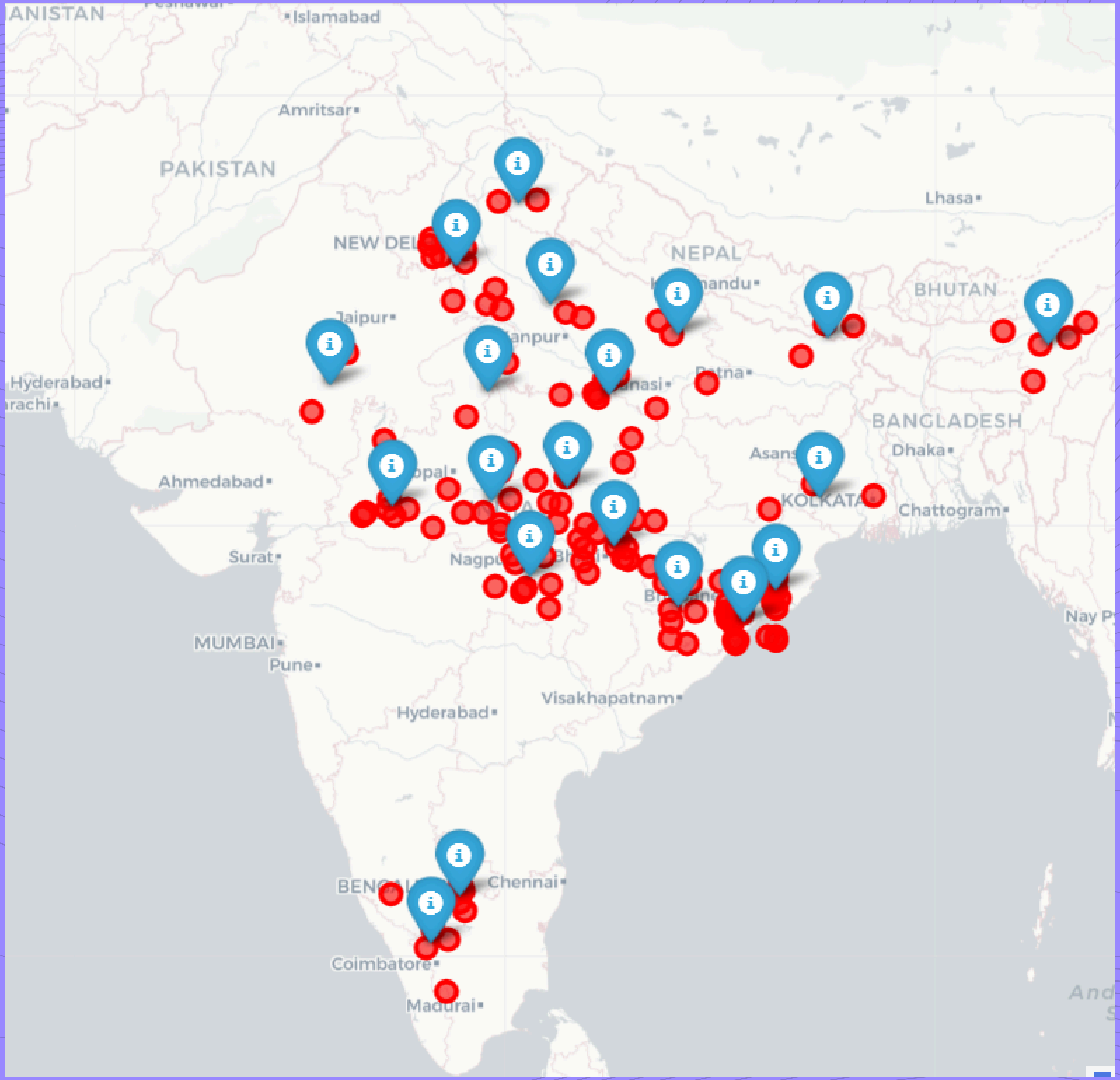
Points of Interest

```python
# Create a base map using Folium
m = folium.Map(location=[23.5937, 80.9629], zoom_start=5, tiles='CartoDB positron')

# Create the heatmap layer
if 'Lat' in tiger_population.columns and 'Lon' in tiger_population.columns and 'TigerCount' in tiger_population.columns:
    HeatMap(heatmap_data, radius=15, max_zoom=13).add_to(m)

# Plot poaching data as red circles
for _, row in poaching_data.iterrows():
    folium.CircleMarker(
        location=(row['Lat'], row['Lon']),
        radius=6,
        color='red',
        fill=True,
        fill_opacity=0.6,
        popup="Poaching Incident"
    ).add_to(m)
```

Code Snippet



Optimization of number of devices used using K-Means clustering

```python
num_clusters = min(len(poaching_coords), 20)
kmeans = KMeans(n_clusters=num_clusters, n_init=10, random_state=42)
kmeans.fit(poaching_coords)
device_locations = kmeans.cluster_centers_

# Create a base map using Folium
m = folium.Map(location=[23.5937, 80.9629], zoom_start=5, tiles='CartoDB positron')

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        color='red',
        fill=True,
        fill_opacity=0.6,
        popup="Poaching Incident"
    ).add_to(m)

# Plot device locations as blue markers
for device in device_locations:
    folium.Marker(
        location=(device[0], device[1]),
        popup="Proposed Device",
        icon=folium.Icon(color='blue')
    ).add_to(m)

# Display the map and save it as an HTML file
m.save('tiger_poaching_map_no_heatmap.html')
m
```

Code Snippet

Thank you!