**Final Project Report: Spatial Analysis of Incident Data in Portland Police Districts.**

**Team Members:** Suprithson Dubba.

Teja Savatapalli.

Navyasree Putluri.

**Dataset:** Crime Forecasting.

**Overview:**

This project involved a comprehensive analysis of incident data provided by the Portland Police from March to May 2017. The analysis aimed to uncover patterns and distributions of various incident types within the city. This project was done by a team of three students (Suprithson, Teja, Navyasree), each contributing to different facets of the project as outlined below.

**Data Preprocessing and Cleaning (Navyasree Putluri)**

**Responsibilities:**

Reading the multi-sheet Excel dataset and parsing the sheets into pandas DataFrames. Cleaning the data by stripping whitespace from headers and cells. Handling missing values, particularly in coordinate columns to ensure the integrity of geospatial analysis.

**Outcomes:**

The preprocessing stage was successfully completed, with the dataset ready for further analysis. A notable step in this phase was ensuring that no missing values in the coordinate columns would skew the spatial analysis, while some missing values in the 'census\_tract' column were deemed acceptable as they did not affect the upcoming geospatial visualizations.

**Data Analysis and Visualization (Suprithson Dubba)**

**Responsibilities:**

Conducting time-series analysis to identify daily and hourly patterns of incidents. Generating various visualizations including line graphs and bar charts to represent the distribution of incidents over time and across categories. Creating a geographical heat map overlaid onto Portland Police Districts to identify hotspots.

**Outcomes:**

Suprithson’s analysis revealed the following: A total of 17,930 incidents were reported, with an average of approximately 578 incidents per day. ‘UNWNT’ (Unwanted Person) emerged as the most frequent case type, followed by ‘DISTP’ (Disturbance – Priority) and ‘SUSP’ (Suspicious Person). The geographical heat map indicated high-density areas of incidents, providing a clear visual representation of hotspots which could be valuable for resource allocation.

**Geospatial Framework and Mapping (Teja Savatapalli):**

**Responsibilities:**

Constructing a fishnet grid with a cell size of 1 km to create a spatial framework for incident data analysis. Overlaying the fishnet grid onto the map of Portland Police Districts to visualize the distribution of incidents spatially.

**Outcomes:**

Teja successfully created a fishnet grid which was then used to produce a detailed map illustrating the spatial distribution of incidents. Each cell represented a 1 km square area, which allowed the team to conduct a granular analysis of incident frequencies across different regions of the city.

**Combined Analysis and Conclusion:**

The project successfully combined traditional data analysis with geospatial analysis techniques to provide a multi-faceted view of the incident data. Key insights include the identification of time-based patterns, the categorization of incidents, and the spatial distribution across the city. The analysis suggested that certain areas within the Portland Police Districts experienced higher frequencies of specific incident types, information that could be leveraged for targeted policing and resource management. The synthesis of these methodologies showcases the potential for data-driven decision-making in urban management and public safety operations. Through the diligent efforts of the team, the project outcomes not only serve academic purposes but also offer practical applications for the Portland Police and public policy makers.

**Visualizations:**

A graph with blue lines

Description automatically generated

Fig 1: The line chart above displays the number of incidents reported each day in March 2017. There is a visible fluctuation in the daily incident counts throughout the month.

A graph with blue squares

Description automatically generated

Fig 2: The bar chart visualizes the distribution of incidents by category, showing which types of incidents are most frequent.

A graph with a green dot

Description automatically generated

Fig 3: The time series line chart illustrates the number of incidents reported at different hours throughout the day. There are peaks and troughs indicating variations in incident frequency at different times.

A map of a map of the area

Description automatically generated with medium confidence

Fig 4: The geographical heat map has been generated, overlaying the incident data onto the map of Portland Police Districts. The red points indicate the locations of incidents, with their density suggesting areas of higher incident frequency.

A graph with numbers and dots

Description automatically generated

Fig 5: The fishnet map has been generated, displaying a grid overlay on the map of Portland Police Districts. Each cell represents a 1 km square area.

**Google Colab Link:**

<https://colab.research.google.com/drive/1u5bCS6-zKAuat_ROEwvkJm2kPa_eZqlx?usp=sharing>

**References:**

* Website: [Archived | Real-Time Crime Forecasting Challenge Posting | National Institute of Justice (ojp.gov)](https://nij.ojp.gov/funding/real-time-crime-forecasting-challenge-posting#data)
* Chainey, S., Thompson, L., & Uhligh, S. (2008). The Utility of Hotspot Mapping for Predicting Spatial Patterns of Crime. Security(21), 4-28.
* Hunt, J. (2016). Do Crime Hot Spots Move? Exploring the Effects of the Modifiable Areal Unit Problem and Modifiable Temporal Unit Problem on Crime Hot Spot Stability. Archived with ProQuest Dissertations & Theses.