Chicago Crime Analysis

Uncovering Patterns, Trends, and Insights for Safer Communities

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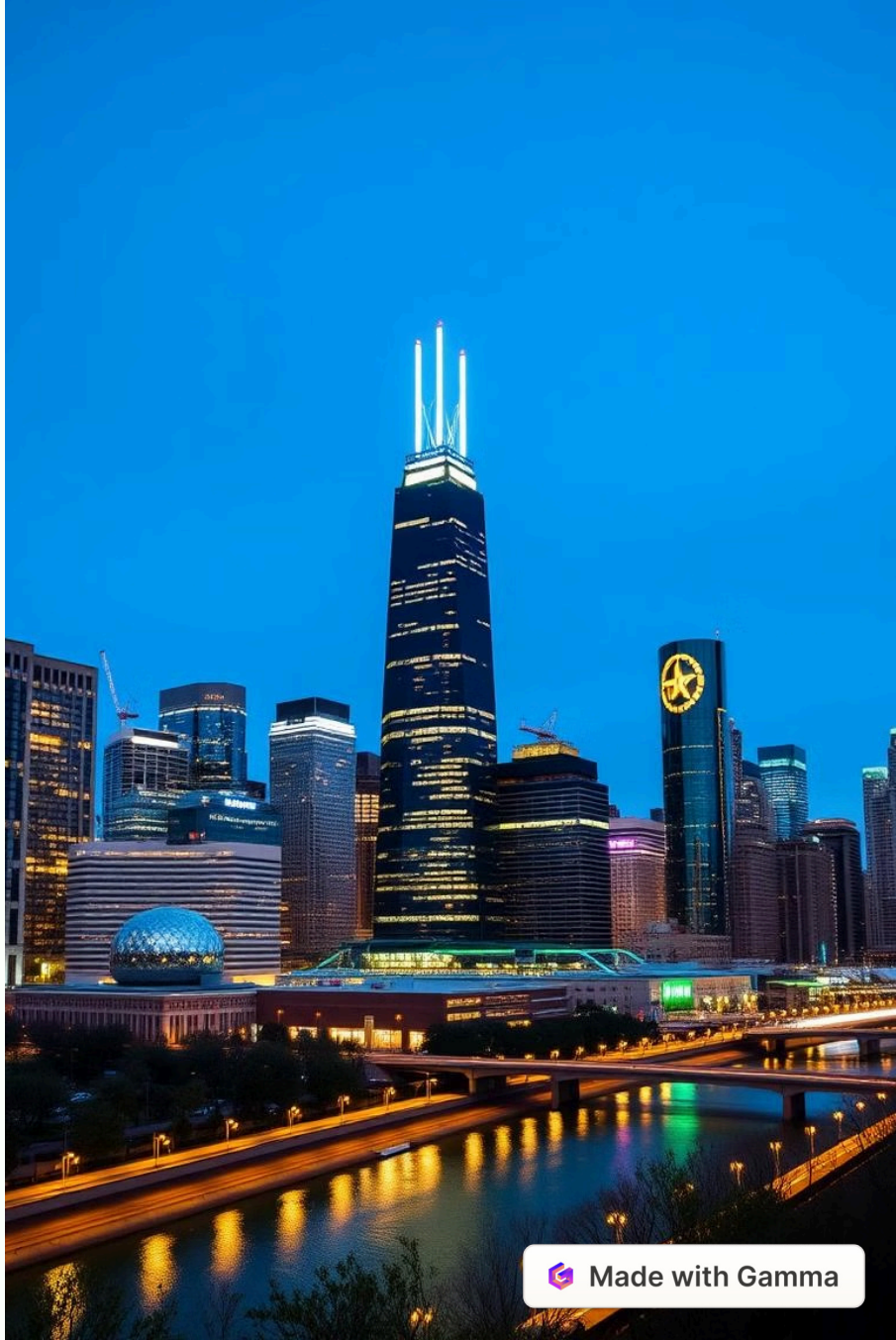
GitHub Repository: **Chicago Crime Analysis**



Problem Statement

Challenges

The increasing complexity and volume of crime data present challenges for law enforcement agencies and policymakers:

- Lack of accessible insights from raw data
- Difficulty in identifying high-risk areas and analyzing trends
- Inadequate tools for efficient resource allocation and community safety enhancement

Objective

Analyze the provided dataset to uncover actionable insights, enabling effective crime prevention and fostering safer communities.

Key Use Cases

Crime Hotspot Identification

Detect areas with high crime rates to focus resources.

Trend and Seasonality Analysis

Analyze patterns based on time of day, week, or year.

Arrest Efficiency Analysis

Evaluate arrest rates across different crimes and locations.

Neighborhood Safety Assessment

Assign safety scores to neighborhoods(Districts/Wards).

Crime Prediction and Prevention

Predict future crime hotspots for proactive measures.

Impact Analysis of Law Enforcement Actions

Measure the effectiveness of policing strategies.

Public Awareness Campaigns

Develop targeted crime awareness programs.

Urban Planning

Inform policies for safer urban infrastructure.

Data Cleaning and Transformation

Detailed workflow available here: https://github.com/Aravind-M2/Chicago-Crime-Analysis/blob/main/Detailed%20flow%20of%20work.txt

1

1. Data Import

Imported raw crime data file

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2. Column Standardization

Spell-checked and standardized columns: Location Description, Description, Primary Type, Block

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3. Date and Time Transformation

Transformed date and time into: Hour of Day, Day of Week, Month of Year, etc.

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4. Duplicate Entry Correction

Used **rapidfuzz** to identify and correct duplicate/misspelled entries

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5. Block Column Cleaning

Cleaned and standardized Block column by consolidating duplicate locations

6

6. Final Output

Final output: Updated dataset saved as "Updated_crime_block_No_null.xlsx"

Location Data Enrichment

Geocoding

Geocoded unique block names to get latitude and longitude using **geopy**

Block Name Preprocessing

Preprocessed block names for accuracy:

- Removed prefixes
- Replaced masked values
- Added "Chicago" as a suffix

Shapefile Integration

Used shapefiles to assign:

- Ward Number
- Community Area
- District

Final Output

Final output: "Location_updated.xlsx" with complete location details

Power BI Visualizations

Data Import

Imported processed data into Power BI:

- Created star schema with ID as the key

Metric Calculation

Calculated metrics using **DAX formulas**:

- Total Crime Count
- Arrest Rate
- Safety Score
- Time of Day
- Season
- Crime Severity

Visualization

Generated **filled maps** with TopoJSON files for geographical visualizations

Dashboards

Dashboards included:

- Crime Hotspots
- Peak Crime Hours

Findings and Insights

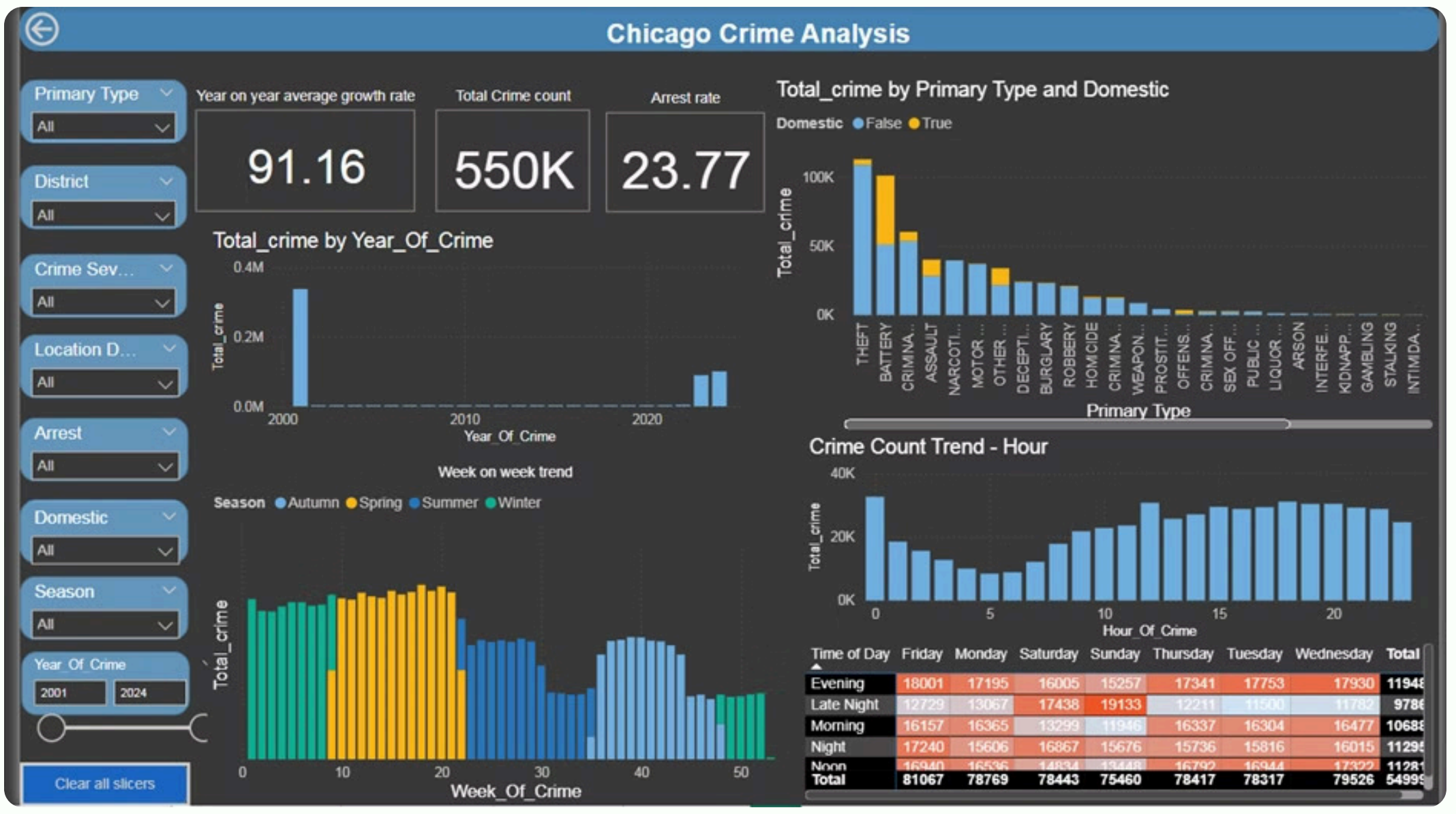
1 **Peak Hour Analysis**

2 **Hotspot Analysis**

3 **Key Findings**

Report:

Peak Hour analysis:



Hotspot analysis:

Key Findings

- Night time Crime Surge: Crimes peak between **8 PM - 12 AM**, accounting for **27%** of all incidents, with **theft** being the most reported offense.
- Weekend Crime Spike: Severe crimes rise by **4.5%** on weekends compared to weekdays.
- Homicide Patterns: Homicide cases increase by **36% on weekends**, particularly during **night and late-night hours**.
- Crimes Involving Children: Offenses against children spike by **52.6%** during **late-night hours (11 PM - 12 AM)**.
- Robbery Timing: Robberies are **highly unlikely** during bright hours and **most common at night**, especially on weekends.
- Narcotics Crime Trends: Unlike homicides, **narcotics-related crimes decrease on weekends and late nights**.
- Arrests in Severe Crimes: While severe crimes are **less frequent**, they make up **65.6% of all cases with arrests**, indicating a stronger focus on violent crime prevention.
- Non-Severe Crime Timing: **66.5% of non-severe crimes occur during bright hours (morning, noon, evening) on weekdays**.
- Theft Hotspot with Zero Arrests: Beat **1831** recorded **111 theft cases between 11 PM - 12 AM** in **District 18, Ward 42**, but **no arrests** were made.
- High-Theft Districts: Districts **12, 18, 19, and 14** (close to each other) and Districts **8 and 6** contribute to **38.4% of thefts between 11 PM - 12 AM**, particularly on streets.
- Winter Crime Surge: Non-severe crimes peak **from mid-winter (January)**, with **January 1st recording the highest incidents**, followed by a gradual decline starting in summer.
- Airport Theft Concerns: Over **500 plus theft incidents** were reported in and around **the airport**, making it a major crime hotspot.

Actionable Insights

Increase Night Patrols

Deploy more law enforcement personnel in high-crime areas during late-night hours, especially on weekends.

Enhance Surveillance & Lighting

Improve CCTV coverage and street lighting in crime hotspots to deter theft and non-severe crimes.

Awareness Campaigns

Conduct educational programs targeting crime prevention, especially focusing on theft trends during winter and spring.

Boost Arrest Rates

Allocate additional resources to districts with low arrest rates to enhance law enforcement efficiency.

Community Engagement

Work with local leaders and organizations to implement social programs that reduce domestic violence and other severe crimes.

Infrastructure Improvements

Conduct regular audits of high-crime areas to address poor lighting, lack of surveillance, and weak security measures.

Neighborhood Watch Programs

Establish community-driven initiatives to encourage public participation in crime prevention.

Seasonal Law Enforcement Adjustments

Increase police presence during winter, spring and festive periods, when crimes tend to spike.

Predictive Policing

Leverage crime trend analytics to anticipate and proactively deploy resources to potential future hotspots.

Cross-Agency Collaboration

Strengthen coordination between law enforcement agencies to enhance response times and resource allocation in high-crime zones.

Strategic Patrols

Optimize police patrol schedules based on peak crime hours and locations to maximize crime prevention efforts.

Tools Used

Programming Language

Python: Data cleaning, preprocessing

Libraries

Libraries: pandas, geopandas, rapidfuzz, geopy

Data Visualization

Power BI: Data visualization and dashboard creation

Mapping

QGIS: Conversion of shapefiles for map visualizations

Conclusion

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Data-Driven Decision-Making

Comprehensive analysis supports data-driven decision-making

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Enhanced Crime Prevention

Enhanced crime prevention strategies

3

Scalable Approach

Scalable approach for other cities

4

Next Steps

Deployment and continuous updates for real-time insights.