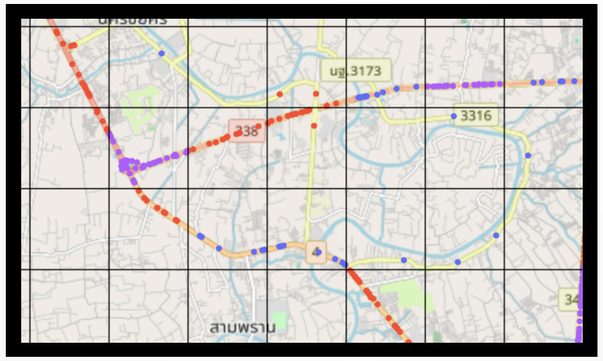
ICCI 2025

GRID-BASED SPATIAL ANALYSIS OF ROAD ACCIDENT PATTERNS IN THAILAND

A comprehensive study analyzing accident patterns using grid-based spatial analysis and vehicle type distribution data from 2019-2023.

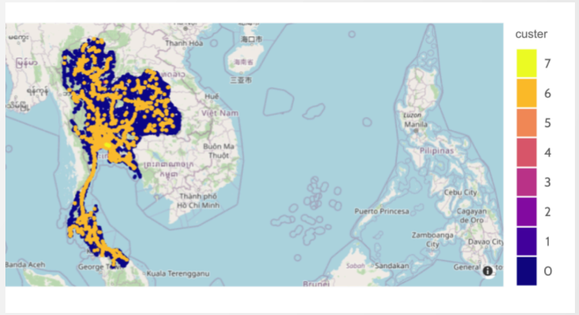
INTRODUCTION

Road accidents in Thailand remain a significant public health concern



The study uses a 0.02° × 0.02° grid for spatial analysis, combining location data with vehicle type distribution (2019–2023).

Severity-Level based chart



K-Mean Clustering Analysis

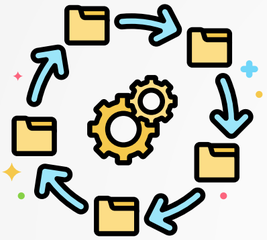
OBJECTIVE

1. To analyze spatial road accident patterns in Thailand: Use grid-based analysis to identify accident patterns and high-risk areas from 2019-2023.

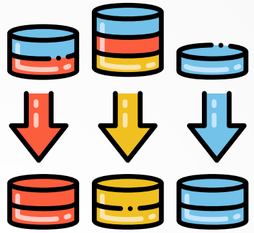
2. To cluster similar accident areas for interventions: Apply K-means clustering to group regions by accident traits.

METHODOLOGY

Data collection



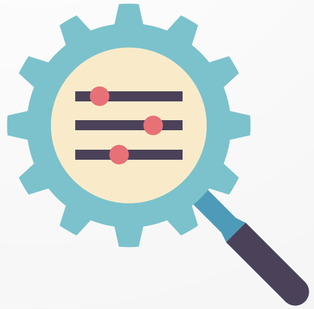
Data preprocessing



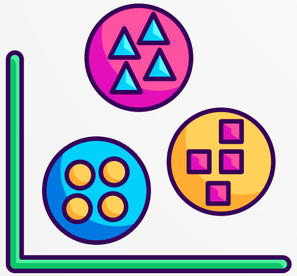
Normalization

Severity level Analysis

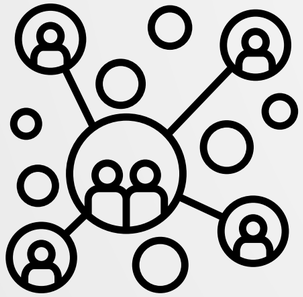
Data visualization



Parameter optimization



K-means clustering



Cluster insights

DATA ANALYSIS APPROACH

Data Collection

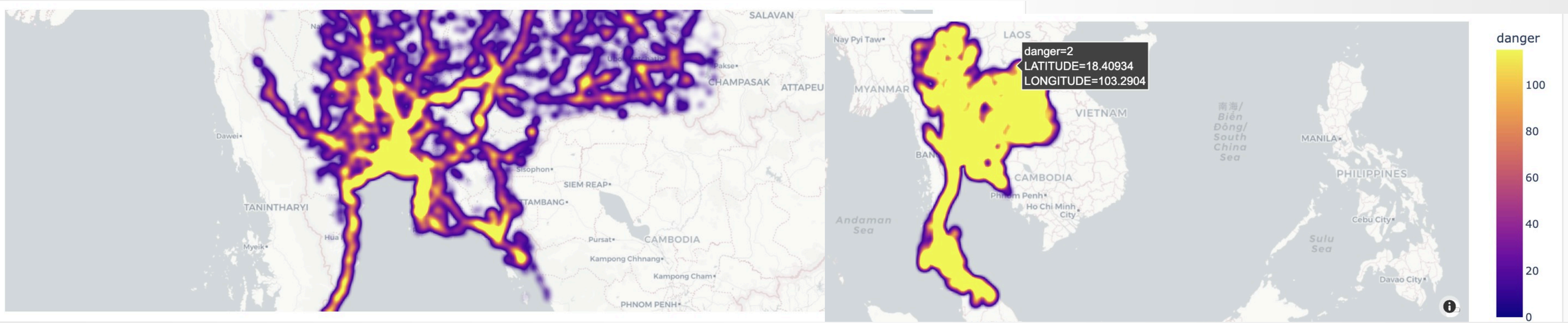
Collect 2019-2023 road accident data from Thailand’s government website, including time, weather, vehicle types, injuries, and fatalities.

Data Preprocessing

Clean data by removing duplicates, standardizing categories, and excluding incomplete records.

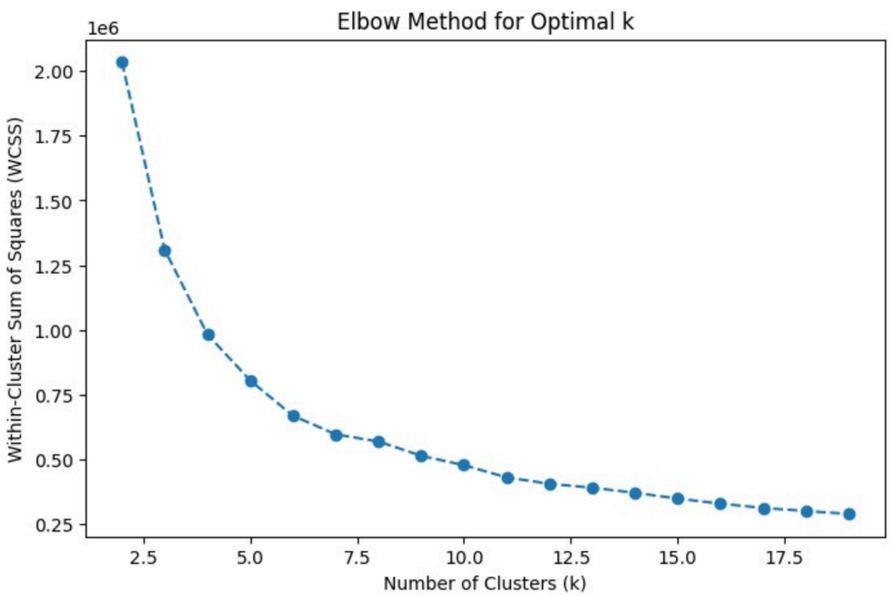
Severity Level and Visualization

Calculated severity index for each grid: Severity = 5D + 2S + M + V (D = fatalities, S = severe injuries, M = minor injuries, V = vehicles involved)



Optimal Cluster Selection

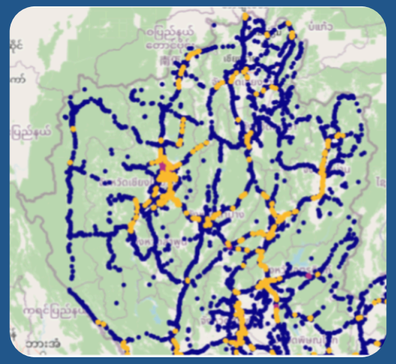
ELBOW METHOD



Optimal k value

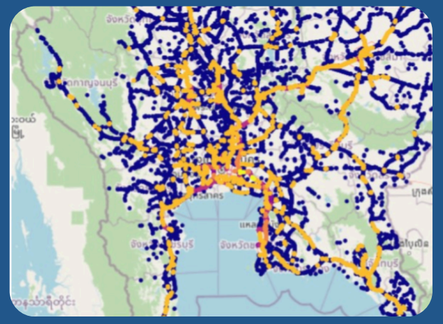
Initially, the Elbow Method suggested K=4, but further analysis showed K=8 provided better separation and compactness (silhouette coefficient: 0.68).

REGIONAL ANALYSIS



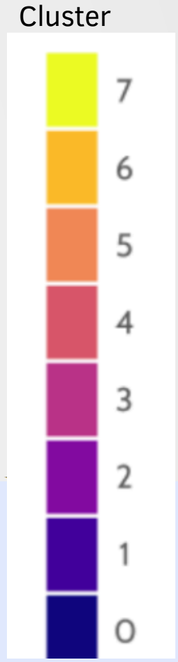
Northern region: Accidents concentrated along mountainous highways

Northeastern region: Dispersed clusters at rural intersections



Central region: High density at expressways and major intersections

Southern region: Hotspots along highways to tourist destinations



K-Mean Clustering Insights

01

Identification

Identified 8 distinct accident pattern clusters

02

Significance

Cluster 7 (near Suvarnabhumi Airport) showed highest risk (5.4× national average)

03

Urban vs Rural

Urban centers had 3.2× higher accident rates than rural areas

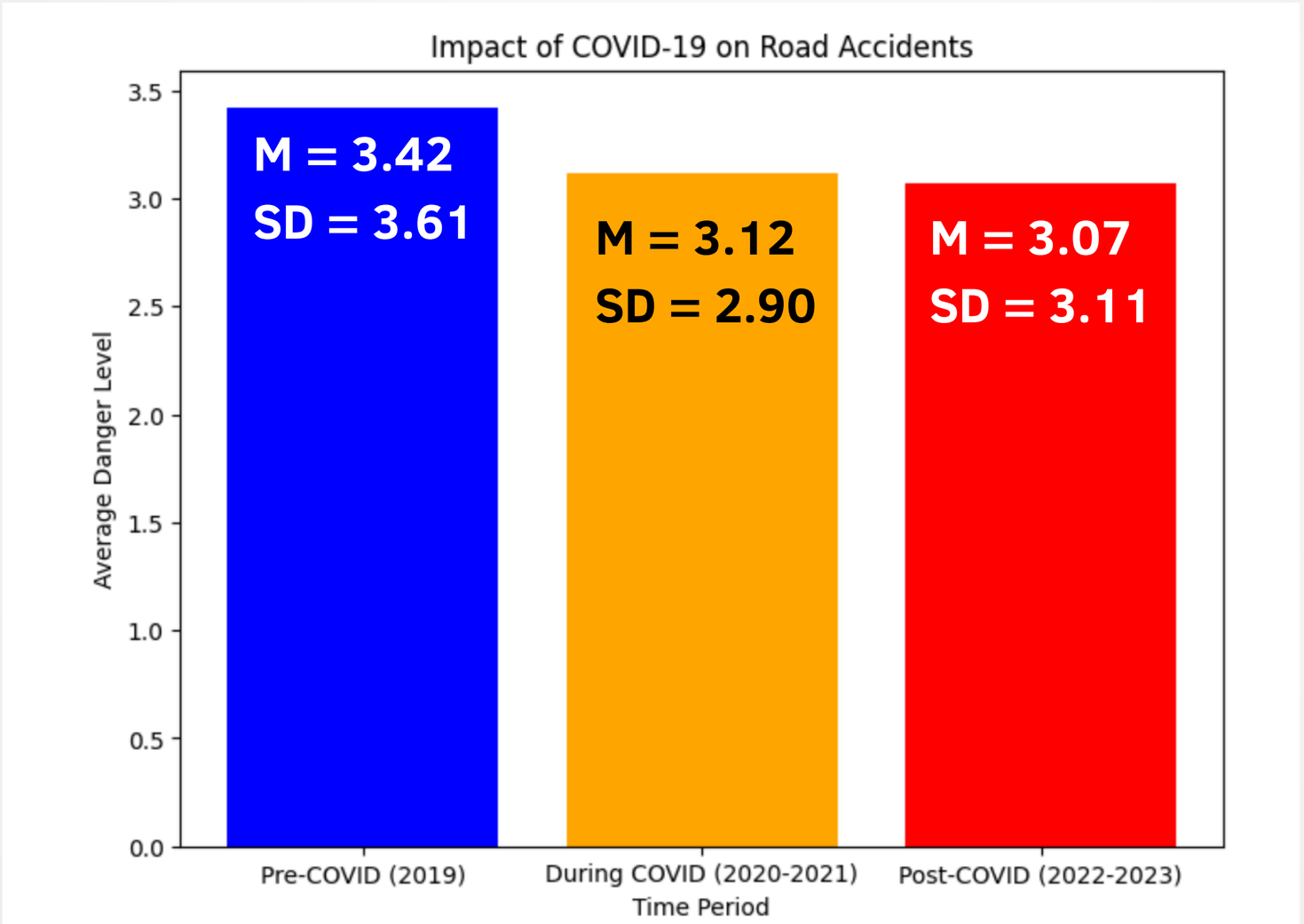
04

Vehicle Types

Private cars and motorcycles were predominant vehicle types in accidents

Temporal Trends

COVID Impact



$p < 0.001$

DISCUSSION

LIMITATION

- Limited time period (2019-2023) may not reflect recent changes
- Grid resolution may be too coarse for dense urban areas
- Limited consideration of weather and infrastructure quality

SUGGESTION

Future research should focus on integrating real-time data and implementing deep learning methodologies to enhance analytical capabilities.

PRACTICAL RECOMMENDATION

High-risk areas (Cluster 7)

AI-based traffic monitoring, dedicated vehicle lanes

Urban centers (Cluster 4 and 5)

Smart traffic light systems, speed monitoring

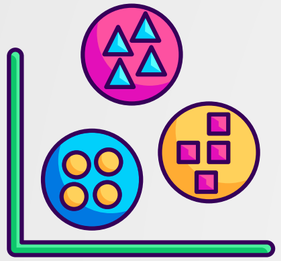
Neutral Area (Cluster 1,2 and 3)

No significant features found in the analysis

Rural areas (Cluster 0 and 6)

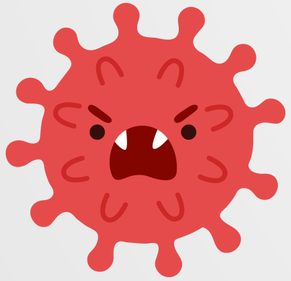
Improved road maintenance, warning signage

CONCLUSION



- K-means clustering successfully identified critical accident-prone areas, making the results more actionable for policymakers.

- Urban hotspots like Suvarnabhumi Airport exhibiting an accident severity rate 5.4 times the national average, while rural areas showed lower risk .



- Temporal analysis showed a significant drop in accident severity during COVID-19

Talent RAC
Robotics, AI, and Coding

THANK YOU