

Phase 3 Project: Predicting Injury-Related Car Crashes in Chicago

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Business Understanding

Stakeholder: Chicago Department of Transportation (CDOT)

Objectives:

1. Predict whether a crash will result in injury or fatality.
2. Identify key risk factors for crash injuries.
3. Inform traffic safety planning and infrastructure investment.

Why It Matters:

- Saves lives by anticipating dangerous situations.
- Helps allocate resources (speed cameras, patrols) effectively.
- Guides better road design and policies.

Data Understanding

- **Dataset:** Chicago Traffic Crashes
- Size: 1.5 million crash records
- Target: INJURY_OR_FATAL (binary)

Key Features Analyzed:

- Weather conditions (rain, snow).
 - Road surface (wet, icy).
 - Time of day (night vs. day).
 - Speed limits and traffic controls.
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- Goal: Extract patterns associated with injury-related crashes.

Feature Selection and Preparation

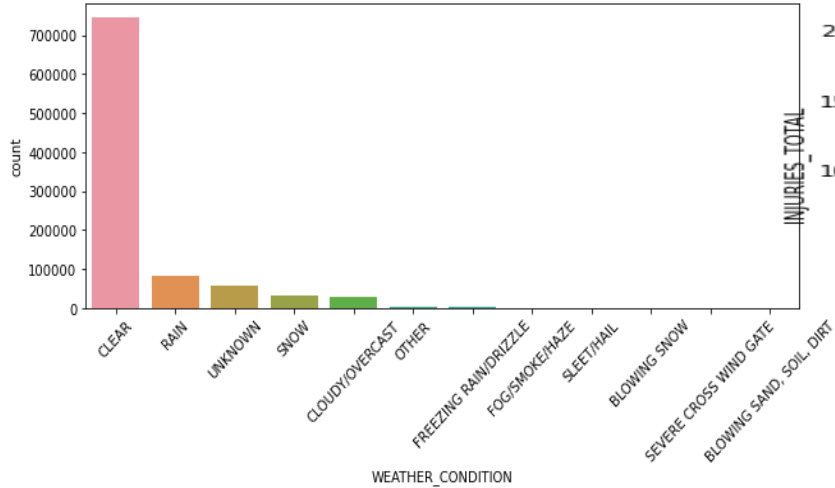
- Selected based on EDA and domain logic
- Features: Hour, Day, Month, Speed Limit, Weather, Lighting, etc.
- Handled categorical variables with one-hot encoding
- Train-test split with stratification (80/20)
- Target variable: INJURY_OR_FATAL

Key Findings

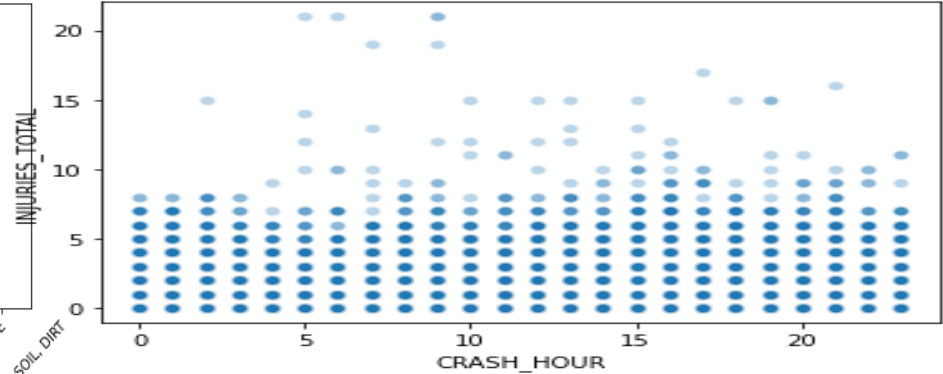
- Nighttime and poor lighting increase injury risk.
- High-speed zones correlate with severe crashes.
- Most crashes occur during night and in poor weather conditions
- Speed limits and road surface condition are key predictors
- Intersections increase severity.

Visualizations

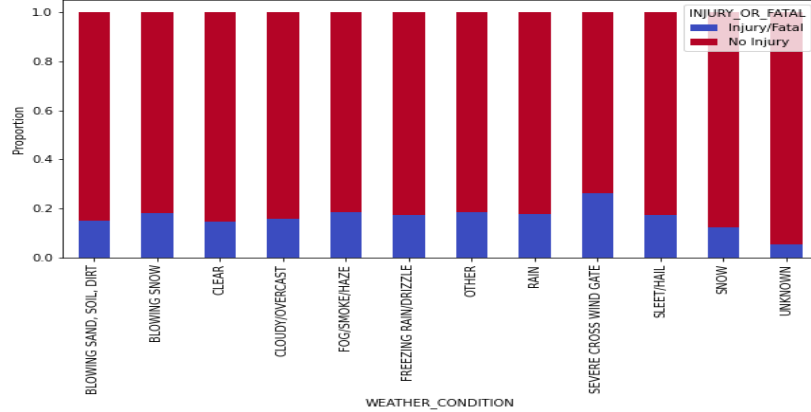
Weather Condition Distribution



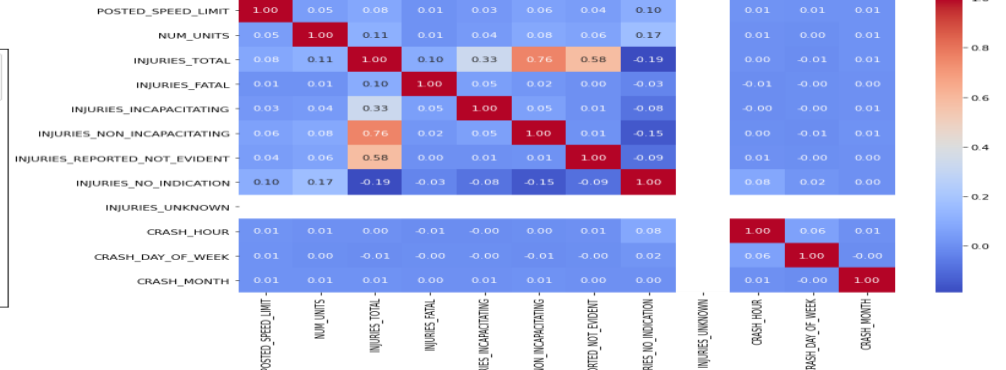
Crash Hour vs. Total Injuries



Proportion of Injuries/Fatalities by Weather Condition



Correlation Heatmap



How Machine Learning Helps

- Predicts injury risk based on past crash patterns.
- Flags high-risk areas for targeted safety measures.
- Example: If dark roads + high speed = danger, recommend better lighting.

Impact on Chicago

- Proactive safety: Fix problems before crashes happen.
- Smarter spending: Focus resources where they're needed most.
- Safer roads: Reduce injuries and save lives.

Recommendations

- Improve lighting at key intersections.
- Increase patrols and awareness during high-risk hours (evenings, weekends).
- Enhance signage and visibility where crashes are frequent.

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**THANK
YOU**