Regional Collision Forecasting for Project and Plan-Level Analysis

Darren Conly

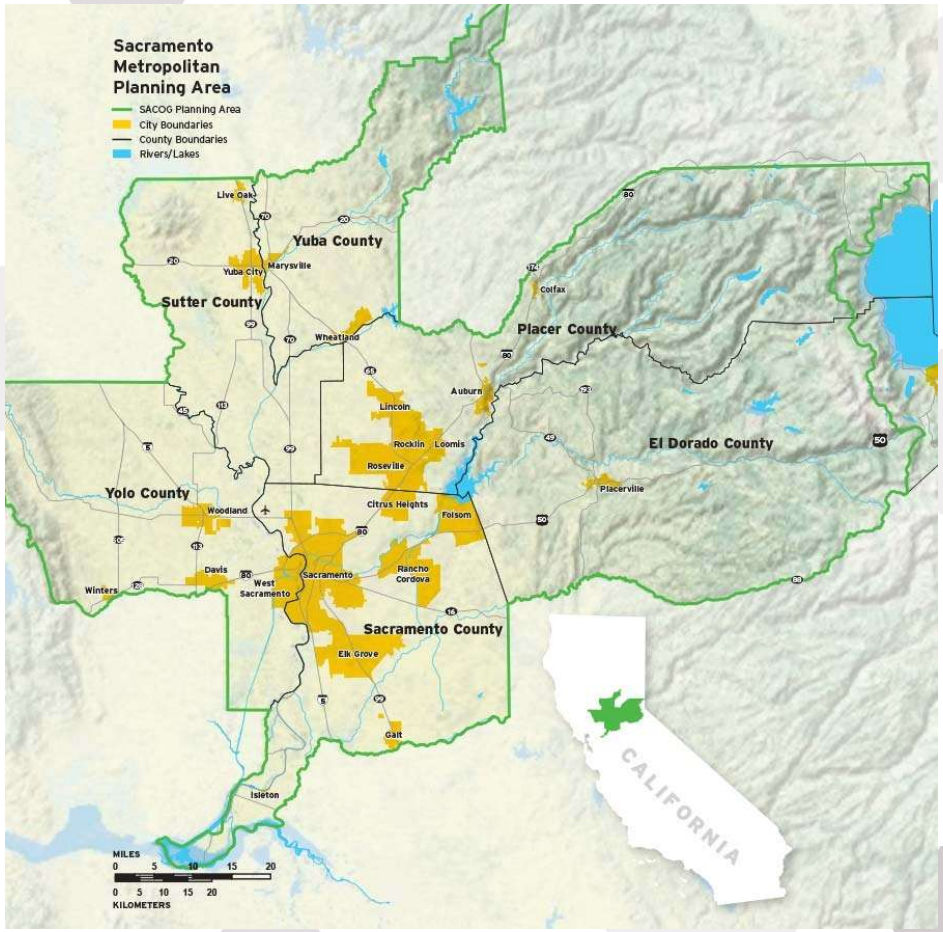
Sacramento Area Council of Governments

Section 1

CONTEXT AND NEED

About SACOG

- Sacramento, CA region
- Six counties
- 22 cities
- ~2.6M residents
- Mix of urban, suburban, rural areas



Existing Collision Prediction Practices

- Focus on project location and project scope
- Do not consider project safety effects over wider area

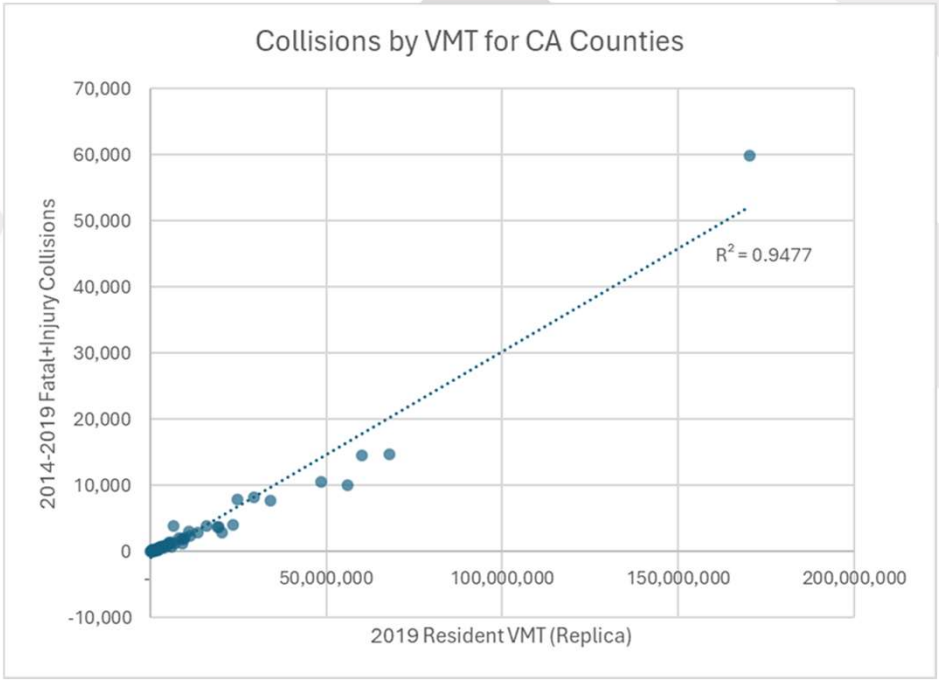
Countermeasure Name	Crash Type	CRF
Add intersection lighting (NS.I.)	Night	40%
Convert to all-way STOP control (from 2-way or Yield control)	All	50%
Install signals	All	30%
Convert intersection to roundabout (from all way stop)	All	Varies
Convert intersection to roundabout (from stop or yield control on minor road)	All	Varies
Convert intersection to mini-roundabout	All	30%
Install/upgrade larger or additional stop signs or other intersection warning/regulatory signs	All	15%
Upgrade intersection pavement markings (NS.I.)	All	25%
Install Flashing Beacons at Stop-Controlled Intersections	All	15%

Source: 2022 Caltrans Local Road Safety Manual

What if a safety project increases driving?

Before project

After project



Key Questions

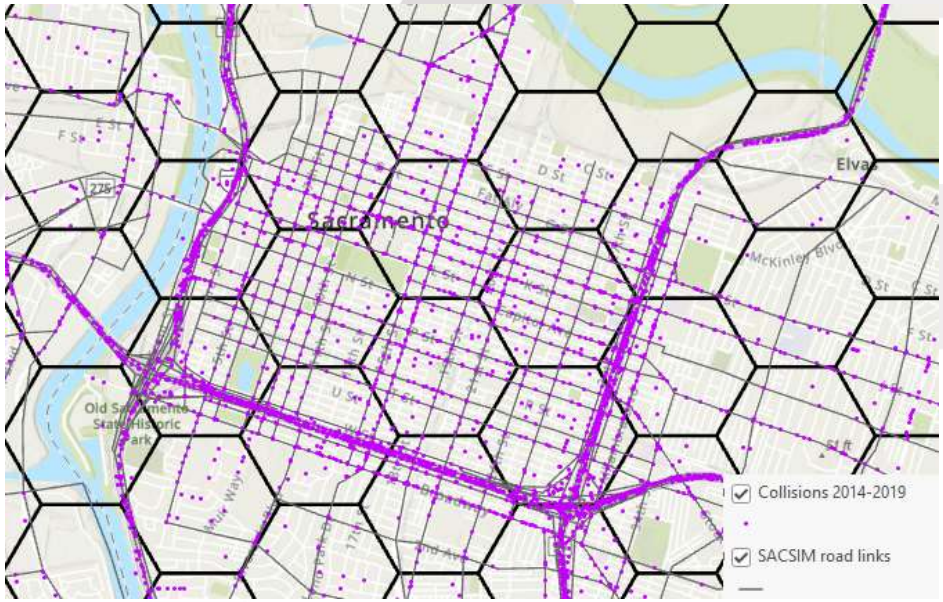
- If a safety project significantly induces more driving, *how much* might it increase collisions regionally?
- *Where* will collisions likely increase or decrease?
- Do non-safety projects have safety benefits if they reduce driving?

Section 1

CREATING A COLLISION PREDICTION MODEL

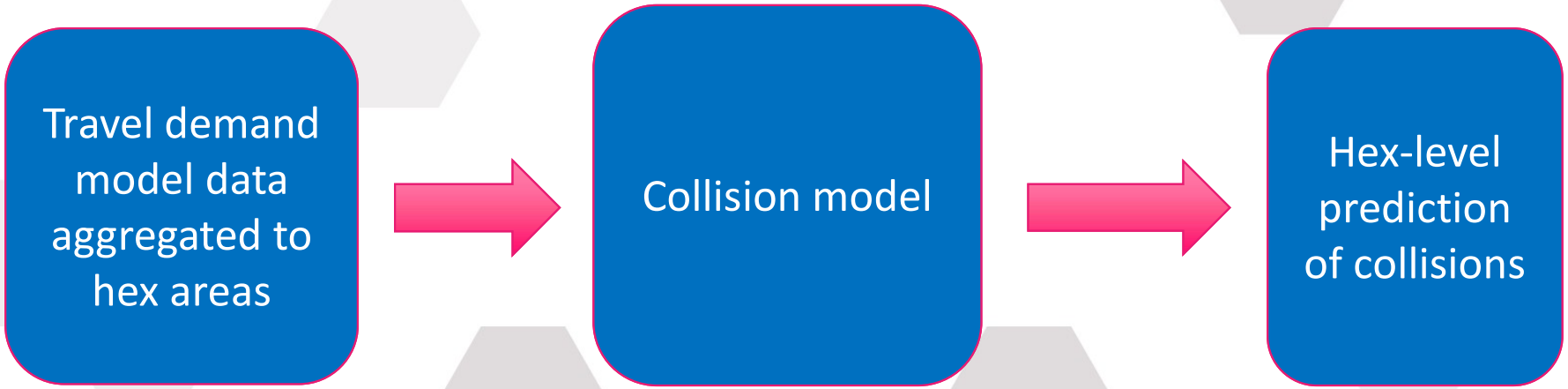
What the model does

Predicts injury + fatal collisions* within 256-acre hexagons

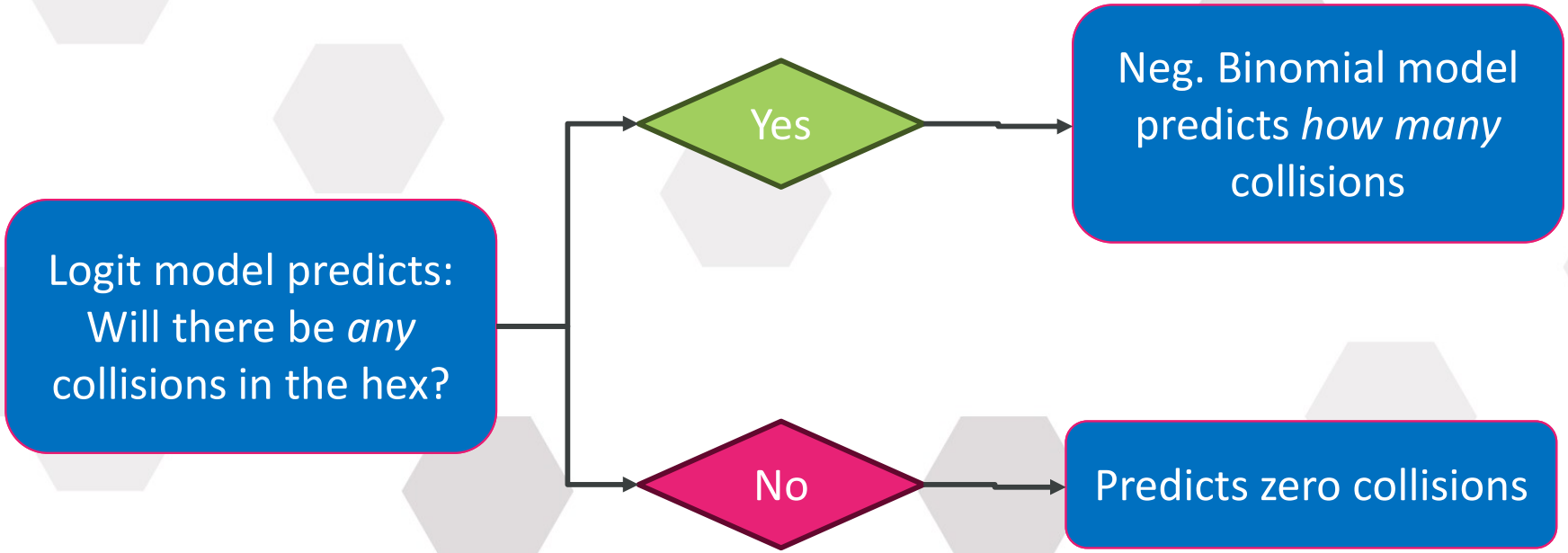


**Does not predict property-damage-only collisions*

Modeling Process



Model Structure



Choosing Prediction Variables

- Identify candidate variables from literature and professional judgement.
- Narrow down to final variables using mix of:
  - LASSO and random forest selection
  - Testing different combinations and validating
  - What our travel model can predict

Example Final Prediction Variables

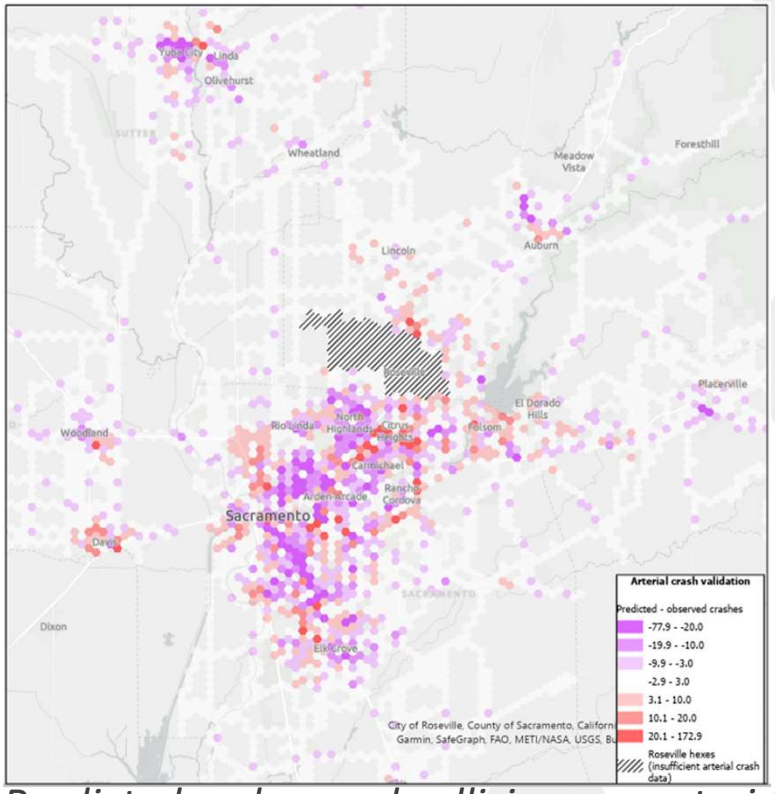
The model predicts collisions in each hex as a function of the hex's:

- Vehicle-miles traveled (VMT)
- Jobs + population
- Transit activity
- Intersection count and types
- Community type (urban, rural, suburban, etc.)
- Road type (freeway vs. non-freeway)

Validation

- Underprediction in testing (expected due to testing setup)
- Moderate r-squared

Metric	Region	
	Arterial	Fwy
Mean Observed	5.81	12.85
Mean Predicted	5.14	12.25
Aggregate Validation Ratio	0.89	0.95
R-Squared	0.66	0.61



Predicted – observed collisions on arterials

Section 1

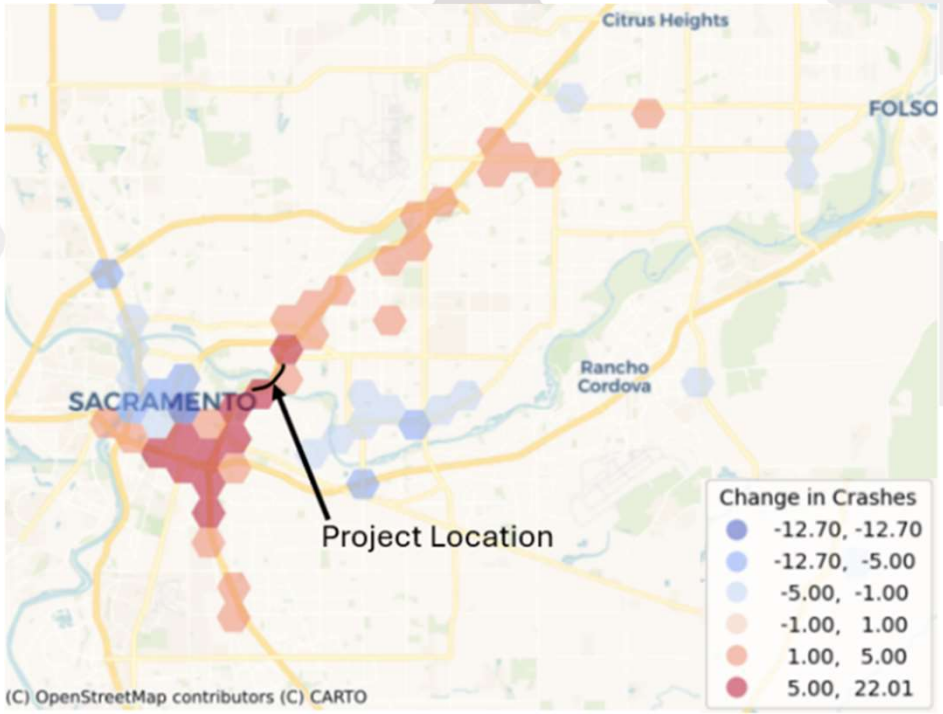
TEST PROJECTS

Example 1: Freeway Widening

Adds HOV lane and auxiliary lane to bottleneck (increases car capacity)

Key findings:

- More collisions on freeways leading to widened bottleneck
- Fewer collisions on alternative routes
- Fewer collisions in disadvantaged communities
- Net **increase** in regional collisions

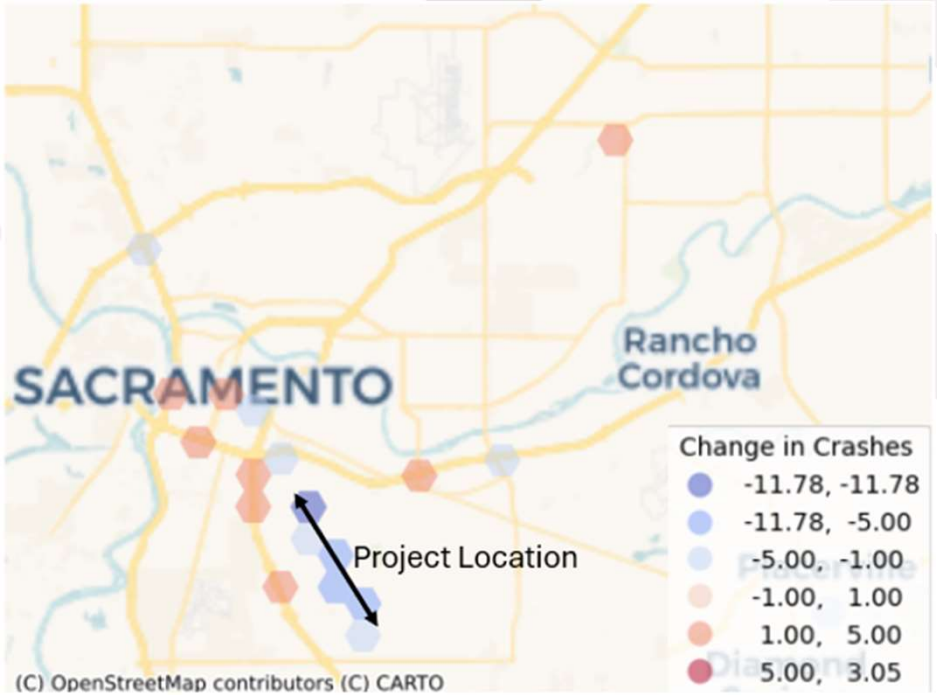


Example 2: Bus Lane Conversion

Converts 1 lane in each direction to bus-only lanes on 2.7mi project segment (reduces car capacity)

Key findings:

- Slightly more collisions on parallel freeways
- Fewer collisions along project segment
- Fewer collisions in disadvantaged communities
- Net **decrease** in regional collisions



Takeaways

Strengths

- *Complements* existing safety analyses by predicting regional effects.
- Flags potential geographic disparities in where collisions increase or decrease.
- Flag hexes needing deeper investigation where model significantly underpredicts crashes.

Areas to Improve

- Does not disaggregate by collision severity or type.
- Currently limited to variables provided by SACOG travel model.
- Predictions only as accurate as travel model's.

Thank you!

Contact information:

- Darren Conly
- dconly@sacog.org

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