10th UTC Spotlight Conference
Pedestrian and Bicycle Safety

Understanding Cyclist Violations at Intersections Using Naturalistic Cycling Data

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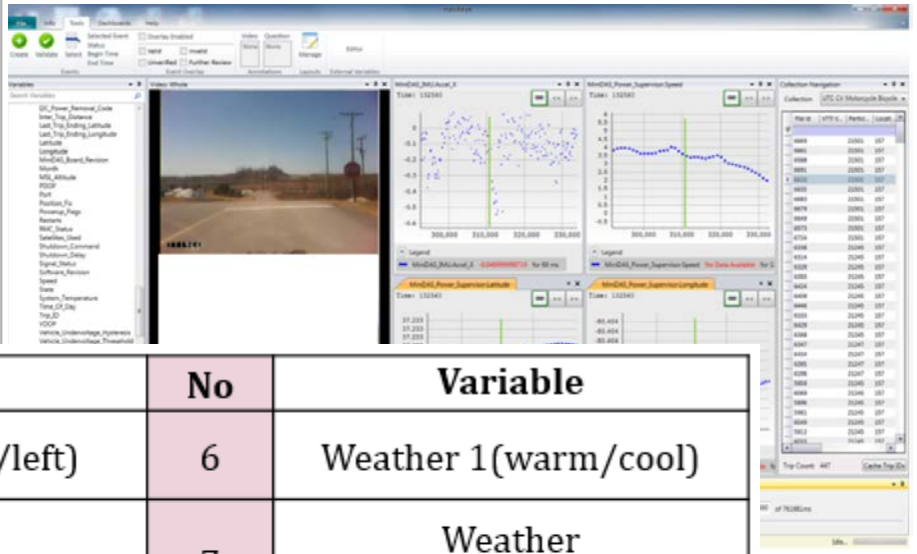
Research Question

- How to prevent/mitigate these intersection-related crashes resulted from bicycle violations?

- Therefore,
  - The failure to comply needs to be predicted.

Data and methods

- The experiment was conducted in three steps; pre-screening, data collection and Data reduction



No	Variable	No	Variable
1	Movement type (right/through/left)	6	Weather 1(warm/cool)
2	presence of other road users(side/opposing/front/adjacent)	7	Weather 2(cloudy/rainy/clear)
3	Time 1 (morning/noon/evening)	8	yellow onset
4	Time 2 (weekend/weekday)	9	red onset
5	Road slope (uphill/downhill/flat)		

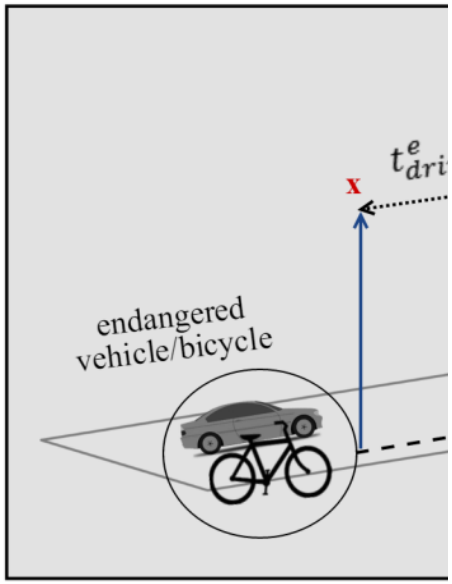
Results
Statistical Analysis

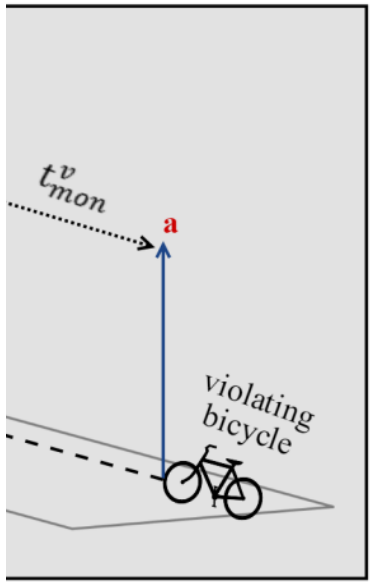
- mixed effects generalized regression model was used
- Signalized intersection,
  - It was found that a cyclist is more likely to violate a red light when making right turns.
  - Besides, the probability of a red light violation decreases when there is side traffic at the intersection or when there is an opposing traffic to the cyclist
- Stop-controlled intersections
  - It was found that right turn, left turn and warm weather are significant factors.
  - Moreover, the likelihood of a stop sign violation increases when no other users are present.

Predicting intersection violations by cyclists

- Prediction is ca … celeration, time to intersec … ough time for the endangered
- t^v_{min} is equivale … driver/rider to react (i.e., $t^e_{d…}$ … dangered

Factor
$mean(TTI)$ over the t^v_{mon}
$range(TTI)$ over the t^v_{mon}
$std(TTI)$ over the t^v_{mon}
$max(TTI)$ over the t^v_{mon}
$min(TTI)$ over the t^v_{mon}
$mean(speed)$ over the t^v_{mon}
$range(speed)$ over the t^v_{mon}
$std(speed)$ over the t^v_{mon}
$max(speed)$ over the t^v_{mon}





Results
Predictive Analysis

- Model Comparison
  - The overall accuracy (ACC), true positive rate (TP) and false positive rate (FP)

	ACC	TP	FP
RF	99.09	99.47	3.33
KNN(k=7)	89.44	97.33	41.33
ANN	91.74	97.37	29.83
Logistic regression	91.28	95.37	33.00

Limitation of this work

- The data collection was conducted in Virginia and most observations were in the small town of Blacksburg.
- Since violations are rare events, collecting more data would also be useful to obtain violation behavior for different types of violations.