

Disparities in Pedestrian Crossing and Driver Yielding Behaviors: Evidence from a Large-Scale Observational Study at Urban Intersections

Anna Beliveau¹, Angela Haddad¹, Emily Podnar¹, Devina Sharma¹, Chandra Bhat¹
¹Department of Civil, Architectural, and Environmental Engineering, The University of Texas,

Introduction

- Pedestrian crash disparities by gender, race, housing status, and income persist, despite safety improvements.
- Drivers' biases have been found to affect yielding behavior.
- Risk of encoding existing pedestrian disparities into AI systems.



Research Goals



- Identify how individual attributes, social context, and time of day or weather conditions influence non-compliant pedestrian crossing behavior.



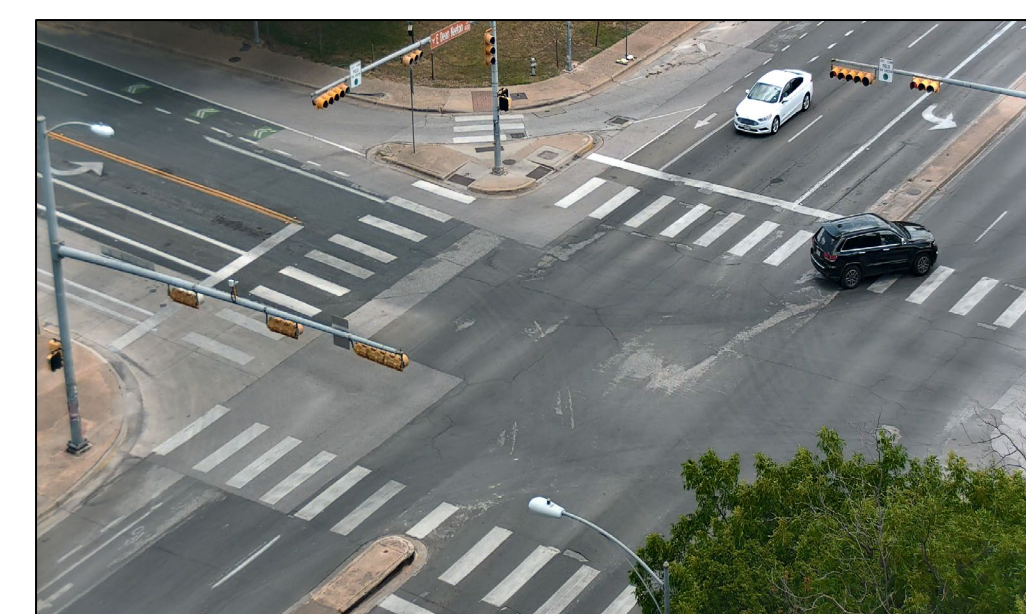
- Analyze factors influencing driver yielding behavior, including pedestrian characteristics, vehicle type driven, pedestrian group dynamics, and temporal conditions.

Data

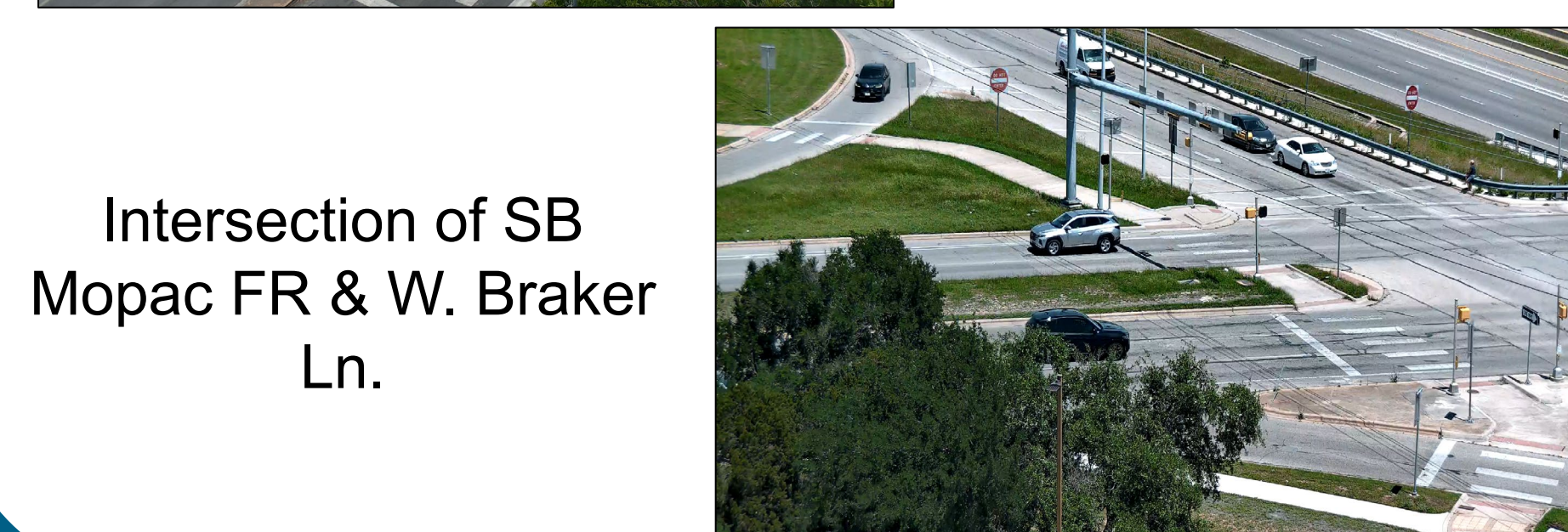
Video data from two signalized intersections in Austin were collected April-June 2024, resulting in 54 total days of recordings across the two intersections. The dataset was manually coded, resulting in 17,251 crossing observations, and 2,767 pedestrian-vehicle interactions. The following variables were included:



- Pedestrian-level:** non-compliance (NCPC), gender classification, estimated age, skin tone designation, visual indicators of housing insecurity (VHI), number of individuals crossing, activity level
- Vehicle-level:** yielding behavior, vehicle type
- Contextual:** weather conditions, time of day



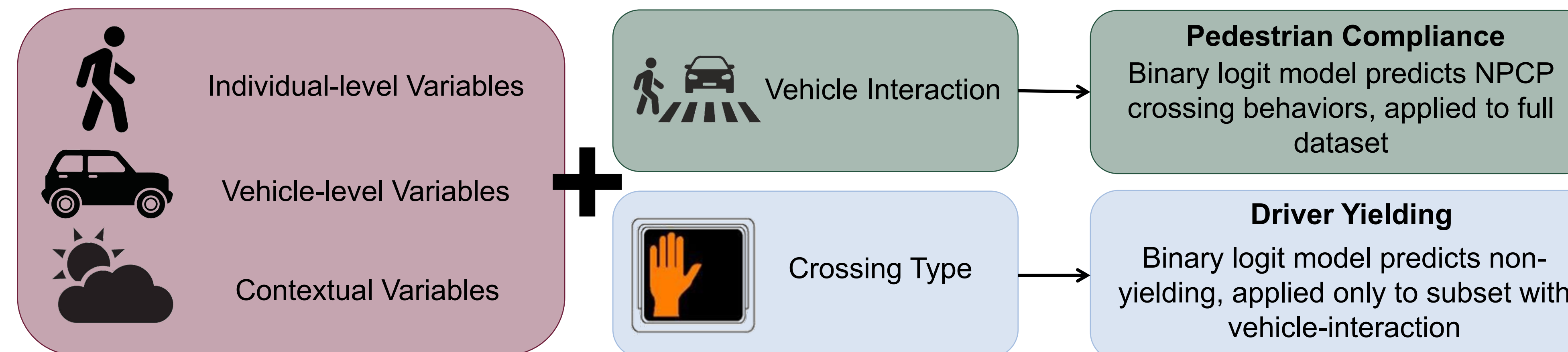
Intersection of E. Dean Keeton St. & San Jacinto Blvd.



Intersection of SB Mopac FR & W. Braker Ln.

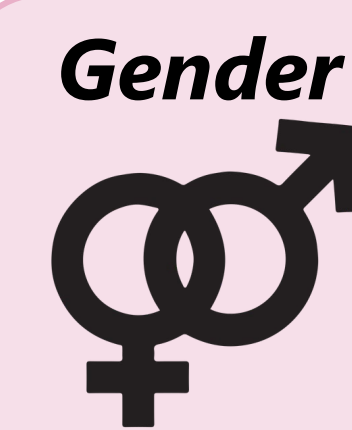
Methods

Two binary logit models were estimated to predict pedestrian crossing and driver yielding behaviors, respectively.



Results

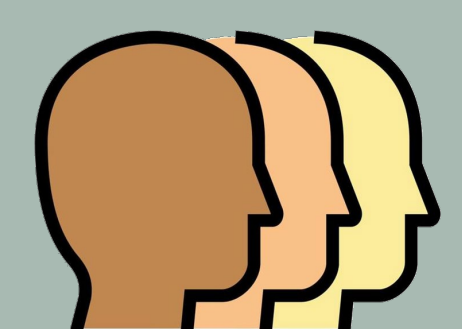
Non-Compliant Pedestrian Crossings



Gender

Men are **49%** more likely to engage in NCPC than women

Skin Tone



Compared to White pedestrians, Brown pedestrians are **15%** less likely, and Black pedestrians are **44%** more likely, to engage in NCPC

Visual Indicators of Housing Insecurity (VHI)



Pedestrians with VHI are **149%** more likely to engage in NCPC

Time of Day



Compliance declines during **peak periods, night, and dawn**. Men and Black/Brown pedestrians jaywalk less during **nighttime** compared to their behaviors during **daytime**

Group Crossings



Groups are **33%** less likely to cross illegally than individuals

Activity Level



Runners are **93%** more likely to engage in NCPC than walkers

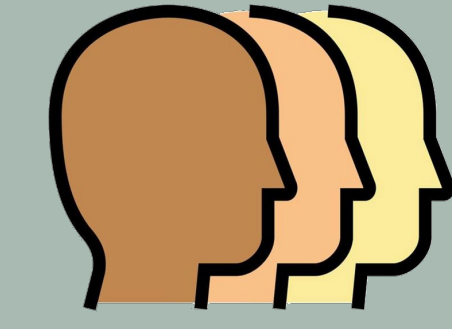
Driver Unyielding (DUY)



Non-Compliant Crossing

Pedestrians crossing illegally are **164%** less likely to be yielded to

Skin Tone



Non-White pedestrians are **25%** less likely to be yielded to

Visual Indicators of Housing Insecurity (VHI)



VHI led to a **127%** increase in the likelihood of driver unyielding

Time of Day



Vehicles are less likely to yield during the **morning** (6:00 am - noon), and less likely to yield to **men** at **night**

Group Crossings



Group crossings led to a **21%** reduction in the likelihood of DUY relative to individuals

Age



Pedestrians over 40 are **84%** less likely to be yielded to relative to their younger peers

Descriptive Statistics

Variable	Number of Observations	Relative Frequency	Vehicle Interaction Rate	NCPC Rate	Non-Yield Rate
Compliant Crossing	15969	91.9%	17.4%	0.0%	11.9%
Non-Compliant Crossing	1405	8.1%	8.3%	100.0%	34.5%
Driver Yielding	2519	87.2%	100.0%	3.0%	0.0%
Driver Unyielding	371	12.8%	100.0%	10.8%	100.0%

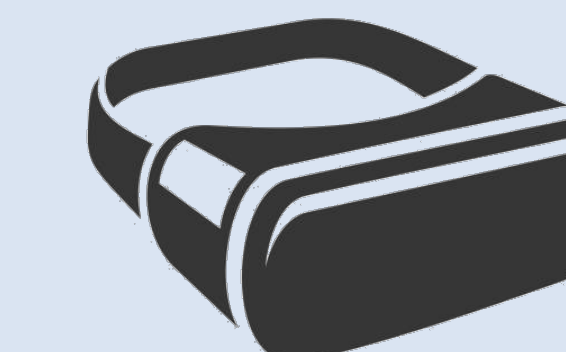
- Non-Compliant Pedestrian Crossing (NCPC) includes crossing against the signal, and crossing outside of the crosswalk
- Driver unyielding (DUY) includes not giving up right of way, and coming too close to a pedestrian in the process of crossing
- 16.6% of the sample involved pedestrian vehicle interactions

Variable	Count	Percent of Total	NCPC Rate	Non-Yield Rate
Male	11661	67.1%	9.0%	13.6%
Female	5713	32.9%	6.1%	11.5%
White	13887	79.9%	8.2%	12.1%
Black	1254	7.2%	11.4%	16.2%
Brown	2233	12.9%	5.8%	15.7%
No VHI	17099	98.4%	7.9%	12.3%
VHI	275	1.6%	21.1%	39.7%
Group	1921	11.1%	5.6%	10.5%
Solo	15453	88.9%	8.4%	13.3%
Runner	1240	7.1%	15.6%	16.2%
Older (40+)	2386	13.7%	9.0%	22.5%

Conclusion

- Crossing outcomes depend on both **behavioral and contextual factors**, including activity type, visibility conditions, and social context.
- Male, Black, and VHI pedestrians face compounded risk**, as they are more likely to engage in NCPC and less likely to be yielded to.
- AI integration has the potential to mitigate observed yielding biases**, but training on biased data could lead to imbalanced detection systems that **encode existing disparities**.
- High risk signalized intersections should include **enhanced lighting, pedestrian-activated signals, refuge islands, and traffic calming**, particularly in areas serving older adults, VHI populations, and nighttime users.

Future Work



VR simulation to identify how situational, social, and environmental factors affect pedestrian crossing decisions.