Modeling Near Miss Leveraging Artificial Intelligence (AI) in Advanced Multimodal Data

Improving safety for all, especially pedestrians and bicyclists, often neglected in research, is crucial. Traditional data sources like police crash reports are sporadic and limited in scope for transportation safety analysis. However, the rise of advanced camera systems integrated with Artificial Intelligence (AI) for detection, ranging, and processing has revolutionized the field. These technologies allow for detailed real-world observations of potential vehicle crashes, making it possible to analyze near-misses in multimodal environments, thereby providing a more accurate assessment of intersection safety. Our study employs LiDAR, video, and sensor data for advanced near-miss detection in safety analysis, surpassing traditional crash report insights. We use a decision fusion model to evaluate safety measures in diverse urban areas, enhancing safety understanding with a focus on AI-driven methodologies. Our public survey provided crucial insights on pedestrian and bicyclist safety perceptions in urban areas, with many voicing concerns about intersection safety. These findings, in line with Vision Zero goals, show strong community support for reducing traffic fatalities and injuries. Integrating this feedback with our AI-driven research enhances urban safety understanding and informs future policy. This approach ensures our recommendations are rooted in real-world commuter experiences, especially for vulnerable groups like pedestrians and bicyclists.

Keywords: Near-Miss Detection, AI/Machine Learning, AI-Driven Safety Analysis, Decision Fusion Model, AI-Enhanced Near-Miss Detection, AI-Integrated Traffic Safety Research.