Acceptance of Vulnerable Road Users towards Automated Vehicles in Urban Traffic

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Abstract

The integration of automated vehicles (AVs) into urban traffic requires more than technical reliability; it depends on how other road users evaluate and respond to them in shared public space. This is particularly relevant for vulnerable road users (VRUs), such as pedestrians and cyclists, whose exposure to AVs is largely unavoidable and whose safety depends on predictable and comprehensible vehicle behavior. Although research on VRU–AV interactions has expanded in recent years, it has predominantly focused on isolated interactions, offering limited insight into how broader social and societal evaluations shape acceptance beyond specific encounters.

This dissertation examines VRU acceptance of SAE Level 4 AVs as a relational and multidimensional process expressed through attitudes and behavioral intentions. Acceptance is structured across three context levels: (a) micro-level interaction-related expectations, (b) meso-level anticipated traffic climate, and (c) macro-level societal reflections (e.g., sustainability, safety, data privacy, and traffic efficiency). Three interconnected studies employed a mixed-methods design. Study I used focus groups with diverse VRU interest groups to identify key expectations and concerns regarding interactions with AVs in mixed urban traffic. Studies II and III surveyed pedestrians and regular cyclists, respectively, to test how micro-, meso-, and macro-level evaluations predict attitudes and behavioral intentions. Behavioral intentions examined in this dissertation included crossing, avoidance, and sabotage-related intentions.

Across studies, attitudes toward AVs were primarily shaped by micro-level interaction expectations, particularly perceived safety, reliability, and ease of interpretation. Behavioral intentions showed a more differentiated pattern: interaction expectations dominated situation-related intentions (e.g., crossing), whereas broader context evaluations gained relevance for more generalized or oppositional intentions. Notably, cyclists' sabotage intentions were more strongly associated with macro-level concerns (especially environmental sustainability and data privacy) and meso-level traffic climate perceptions than with interaction-related expectations. These findings highlight that acceptance-related conflicts and resistance cannot be addressed through interaction design alone but require coordinated consideration of social norms and societal expectations.