Paper title: **Studying the Safety Impact of Autonomous Vehicles Using Simulation-Based Surrogate Safety Measures**

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1. Summary:

1.1 Motivation/purpose/aims/hypothesis:

The purpose of this research article is to evaluate the safety impact of autonomous vehicles (AVs) using simulation-based surrogate safety measures. The hypothesis is that AVs can reduce traffic crashes and improve safety on the roads.

1.2 Contribution:

The contribution of this research article is to provide a simulation-based approach to evaluate the safety impacts of AVs, particularly when there is limited empirical data on their safety performance.

1.3 Methodology:

The methodology used in this research article involves the use of VISSIM as the traffic microsimulation platform and Surrogate Safety Assessment Model (SSAM) to extract the number of potential conflicts based on surrogate safety measures from simulated data. Two case studies were conducted, one on a signalized intersection and the other on a roundabout, with varying penetration rates of AVs.

1.4 Conclusion:

The research findings suggest that a high AV penetration rate might be required to deliver AVs' anticipated safety benefits. The simulation-based approach presented in this paper provides an important tool to evaluate safety impacts of AVs, particularly when there has been very limited empirical data on safety performance of AVs.

2. Limitations:

2.1 First Limitation/Critique:

One limitation of the research is the challenge in replicating the real-world behavior of autonomous vehicles (AVs) within a simulated road network. This limitation arises from the ongoing development of AV technology, which introduces uncertainties in how AVs will interact with human-driven vehicles and the overall road environment. As a result, the simulation-based approach may not fully capture the complexities and nuances of AV behavior in real-world scenarios, potentially impacting the accuracy of the safety impact assessments.

2.2 Second Limitation/Critique:

Another limitation of the simulation-based approach is its inability to comprehensively encompass all possible scenarios and interactions between AVs and other road users. The complexity of real-world traffic conditions, including diverse driving behaviors, unexpected events, and infrastructure variations, presents challenges in accurately representing the full spectrum of interactions that AVs may encounter. Consequently, the findings derived from the simulation-based surrogate safety measures may not fully reflect the intricacies of AV integration into diverse and dynamic road environments.

3. Synthesis:

The concepts and findings presented in this research article hold significant potential for informing the development and assessment of autonomous vehicle (AV) technology and its implications for road safety. Addressing the limitations of the simulation-based approach can lead to more robust evaluations of AV safety impacts, thereby contributing to the advancement of AV technology and its integration into diverse real-world traffic scenarios. Furthermore, future research endeavors can expand the scope of the study to encompass a broader range of complex traffic conditions and AV penetration rates, providing valuable insights for policymakers, urban planners, and transportation engineers as they navigate the evolving landscape of AV implementation and safety considerations.