

**CHAPTER**

**2**

**SAFETY ASSESSMENT USING  
SURROGATE SAFETY  
ASSESSMENT MODEL - A  
BIBLIOMETRIC ANALYSIS  
AND REVIEW**

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**2.1 INTRODUCTION**

Autonomous vehicles (AV) have the potential to revolutionize the future transport by alleviating the traffic operations as well as safety conditions. AVs, equipped with immaculate sensors and technology can perform the steering, acceleration and braking operations without direct involvement of human drivers (Rosique et al., 2019). A number of simulation studies and real-world testing have been done to evaluate the impacts of AVs on current transport system. The key benefit of employing AVs is to minimize the role of human drivers and their consequent driving errors, that have been endorsed as a contributory factor in 93% of the accidents (Aria et al., 2016). The discrete nature of AVs can offer improved safety and operational benefits to our transport system by eliminating the human errors. However, the major benefits of AVs are associated with their higher penetration rates, that are expected to occur between 2040 to 2060 (Litman, 2022).

Traffic simulations have been frequently adopted to investigate various aspects of AVs since they offer the flexibility of evaluating any new and complex technology in a safe, quick and affordable manner (Raju & Farah, 2021). In conjunction with traffic simulations, the application of surrogate safety assessment model (SSAM) has been endorsed as potential technique to evaluate the safety impacts of AV. SSAM was developed by the federal highway administration (FHWA) to assess the safety aspect by analysing the vehicle trajectories obtained from various microsimulation software (Gettman et al., 2008).

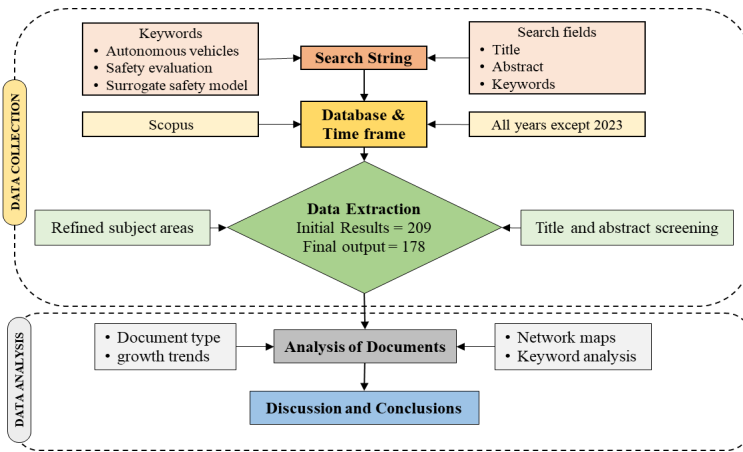
Many studies have employed SSAM in conjunction with microsimulation tools for safety evaluation of AV (Elawady et al., 2022; Morando et al., 2018; Tibljaš et al., 2018; Viridi et al., 2019). Despite, sufficient available literature on this topic, there is a need of comprehensive mapping of published literature from a global perspective. Bibliometric analysis is now widely recognized as a prominent technique for mapping published literature and forecasting research trends related to various topics. Therefore, this chapter presents a bibliometric analysis on the application of SSAM for safety evaluation of AV.

## **2.2 DATA AND METHODS**

The methodology adopted in this study consists of two key phases including data collection and data analysis. Data collection involved selection of database, formulation of search strategy, data extraction and screening. Whereas data analysis involved the application of various tools such as Microsoft Excel 365 and VOSviewer 1.6.18 to analyse the documents extracted from the database. The details of the key phases and their sub-steps are shown in Figure 2.1.

In the first step, suitable search string was defined based on the keywords, which was then used in Scopus database to extract the relevant documents. The Scopus database was selected because of its comprehensive and extensive coverage of academic publications, which surpasses other databases like Web of Science or Google Scholar in

terms of expansion and regular updates (Amlan et al., 2023). Second step involved the extraction and screening of documents. Initially, search string was used in database which was further refined by limiting the time frame and research areas. After screening, a total of 178 documents were extracted for analysis. In the third step, the extracted documents were analysed by using various tools. The tools were employed to establish findings on the documents type and growth trends, citation analysis, co-occurrence networks and research clusters.



**Figure 2.1** Research framework (Source: Azam et al., 2022; Kushairi & Ahmi, 2021)

## 2.3 PUBLICATION TRENDS AND INSIGHTS

This analysis examines annual publication trends, identifies leading contributors across countries, institutions, and sources, and explores thematic connections through co-occurrence of author keywords.

### 2.3.1 Annual Publications Trends

Figure 2.2 illustrates the trend in annual publications on the topic, along with their corresponding subject areas. It also includes an exponential trend line to highlight the growth in publication volumes within this specific research area.