I. INTRODUCTION

The landscape of Smart Factory systems has rapidly evolved, especially with the integration of Autonomous Vehicles (AVs) [1]. However, despite these advancements, there exists a critical gap in addressing the urgent safety challenges specific to industrial AVs within Smart Factory environments [2]. The urgency of this research stems from the need to mitigate the impact on operational safety and prevent accidents in these dynamic settings.

Current technologies in Smart Factory systems lack comprehensive safety measures, leading to a concerning frequency of accidents during operations. This underscores the critical need for real-time object detection and advanced safety protocols to safeguard the well-being of workers. Existing methodologies have demonstrated limitations, prompting the exploration of novel approaches to enhance safety in industrial AV operations.

This study addresses the urgent concerns surrounding worker safety by introducing a groundbreaking methodology. Leveraging the YOLOv8 algorithm, renowned for its real-time capabilities, and adopting the Structured Assurance Case Metamodel (SACM) Notation, the research aims to revolutionize safety assurance in Smart Factory operations. The proposed approach goes beyond the limitations of previous methods, offering a meticulous analysis of hazards, rigorous risk evaluation, and evidence-backed safety arguments.

In the context of Smart Factory systems [1], where AVs play a pivotal role, the significance of this research becomes evident. By citing recent developments [2], the study propels the urgency of adopting advanced safety measures to address the transformative impact of autonomous technologies. Our methodology, with its emphasis on SACM notation, provides a standardized and expedited means to articulate safety claims, arguments, and evidence systematically, filling a crucial gap in the existing research landscape.