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A Study on the Establishment and Utilization of Dataset for Construction Safety AI

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ABSTRACT

Construction sites are inherently hazardous, with a notably higher risk of accidents in small-to-medium-scale projects and during the early and final stages of construction. In response, the implementation of automated safety monitoring systems has become increasingly important. Recent research has focused on utilizing computer vision-based object detection models for enhancing on-site safety. Although construction-specific datasets like MOCS have facilitated training and evaluation, these models often suffer from performance degradation in real-world settings due to rapidly changing environments, fluctuating lighting and weather conditions, and diverse equipment and personnel.
This study proposes a methodology to enhance model robustness by applying unsupervised learning techniques and carefully structuring negative object classes to better represent unseen conditions. By expanding the dataset with diverse site environments and constructing a comprehensive, resilient object class taxonomy, the proposed approach improves model generalization. Our findings indicate that the resulting system is more adaptable and reliable than conventional methods, making it suitable for real-time safety monitoring and hazard detection across varied construction scenarios.

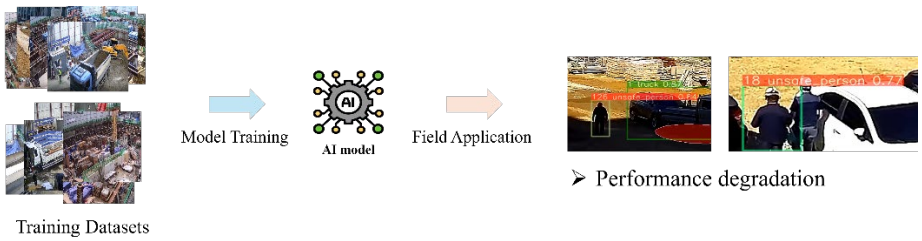

Fig. 1 Performance Degradation at construction sites

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REFERENCES

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Yang, Yukuan, et al. "Restoring negative information in few-shot object detection." *Advances in neural information processing systems* 33 (2020): 3521-3532.

Kim, Hyung-Soo, Jaehwan Seong, and Hyung-Jo Jung. "Optimal domain adaptive object detection with self-training and adversarial-based approach for construction site monitoring." *Automation in Construction* 158 (2024): 105244.