Domain Adaptation Save Lives - Drowning Detection in Swimming Pool Scene Based on YOLOV8 Improved by Gaussian Poisson Generative Adversarial Network Augmentation

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Abstract : Drowning is a significant safety issue worldwide, and a robust computer vision-based alert system can easily prevent such tragedies in swimming pools. However, due to domain shift caused by the visual gap (potentially due to lighting, indoor scene change, pool floor color etc.) between the training swimming pool and the test swimming pool, the robustness of such algorithms has been questionable. The annotation cost for labeling each new swimming pool is too expensive for mass adoption of such a technique. To address this issue, we propose a domain-aware data augmentation pipeline based on Gaussian Poisson Generative Adversarial Network (GP-GAN). Combined with YOLOv8, we demonstrate that such a domain adaptation technique can significantly improve the model performance (from 0.24 mAP to 0.82 mAP) on new test scenes. As the augmentation method only require background imagery from the new domain (no annotation needed), we believe this is a promising, practical route for preventing swimming pool drowning.

Keywords : computer vision, deep learning, YOLOv8, detection, swimming pool, drowning, domain adaptation, generative adversarial network, GAN, GP-GAN

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