SAFETY HELMET WEARING DETECTION MODEL BASED ON YOLO-V8

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***Abstract*: In later a long time, development mishaps have happened as often as possible. The security ensure measures for development work force are tossed into sharp center. Wearing protective caps is one of the foremost critical prerequisites to secure the security of development staff, and the location of wearing security protective caps has ended up fundamental. For the issues of the existing protective cap wearing discovery calculation such as as well numerous parameters, significant location interferer, and moo discovery exactness, in this paper a protective cap wearing location show YOLOV8S is proposed. Firstly, MobileNetv3 is embraced as the spine organize of YOLOv5s for the highlight extraction, which can decrease the number of show parameters and show estimate. Besides, a residual edge is presented within the include combination. The first highlight outline data is intertwined amid include combination, and the location capacity of little targets is upgraded. At final, by changing the association between CAM and SAM, an unused consideration module BiCAM is outlined. The comparison tests appear that the discovery precision of YOLOV8S is 2.22% higher than YOLOv5s, and the show parameter amount is diminished to 3/4 of YOLOv5s. Beneath the same discovery conditions, the discovery speed of YOLOV8S is better than the other models, which meets the precision prerequisites of head protector discovery within the development scene.**

Index Terms: Consideration instrument, include fusion, security head protector, YOLOv5s model

1. INTRODUCTION

With the advancement of social informatization, shrewdly gadgets are broadly utilized within the businesses. For illustration, the permit plate acknowledgment framework is utilized in stopping parts. The confront acknowledgment framework is utilized in shopper places, etc. Within the development industry, the development environment is complex, and the damage hazard of falling objects is tall. Security head protectors can ensure the laborers and diminish the effect of falling objects, and avoid laborers from being harmed by falling objects [1]. Laborers who don't wear security head protectors have awesome potential security dangers. Subsequently, wearing security protective caps in generation operations can essentially secure the security of the workers' lives. Security protective cap wearing location is essential for the security of specialists. Within the early days of development locales, a few individuals were extraordinarily assigned to administer whether laborers wearing security head protectors or not. In any case, development laborers worked in a wide run and it was troublesome to discover the specialists who did not wear the security head protectors. In expansion, the conventional supervision strategy squandered the labor [2]. For the security generation necessities on modern development locales, deep learning-based computer vision strategies are more suitable for real-time checking of development sites.

With the quick inquire about improvement within the field of deep learning, numerous analysts started to utilize profound learning calculations on the safety-helmet location. Within the protective cap discovery calculation based on YOLO, the yield measurement of the classifier was altered to decrease the numbers of parameters. The calculations had great real-time execution but the exactness was moo [3]. An progressed target location calculation based on YOLOv3 combined the focal points of IoU and GIoU, and it centered on covering regions and nonoverlapping regions. Besides, a modern objective work was proposed, which made strides the precision [4]. An calculation connected the lightweight structure on the MobileNet arrange and it compressed YOLOv2 [5]. YOLO-S was a lightweight head protector wearing discovery show. It adjusted information categories by information upgrade, and supplanted the initial spine arrange with the lightweight arrange MobileNetV2. It diminished the organize calculation, and at last performed pruning and information refining on the demonstrate channel [6].

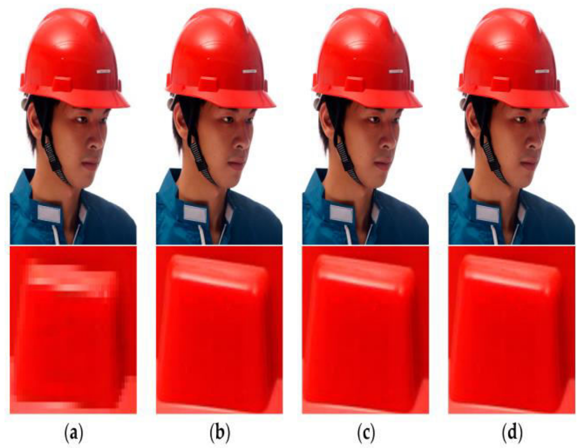

Fig 1 Example Figure

A real-time head protector wearing discovery calculation implanted the ECA-net module into YOLOX's include combination network, and utilized CIOU misfortune rather than DIOU misfortune to get superior protective cap location comes about [7]. Light-YOLOv4 employments inadequate preparing and pruning methodologies based on YOLOv4. The made strides demonstrate compresses the show estimate to 10% with a slight misfortune of exactness, and the location speed is additionally significantly progressed [8]. BiFA-YOLO proposes a two-way highlight interaction strategy, which viably combines multi-scale include data. Pointing at the issue of conflicting target points, this paper proposes an point classification structure to get target point data [9].

Modules

1) Importing Libraries: Begin by importing the necessary libraries such as OpenCV, NumPy, and PyTorch. These libraries will be used for image processing, numerical operations, and deep learning.

2) Importing Helmet and Traffic Datasets: Collect and import the datasets containing images of construction sites and traffic scenes. Ensure that the datasets are labeled, meaning that each image is annotated with bounding boxes around the helmets or traffic signs.

3) Exploratory Data Analysis (EDA):

Rescaling the Image: Preprocess the images by rescaling them to a consistent size. This step ensures that all images have the same dimensions, which is required for the YOLOv8 algorithm.

Resizing: Resize the images to a size suitable for training. It's important to strike a balance between image size and computational resources.

4) Applying the Algorithm (YOLOv8):

- Install YOLOv8: Install the YOLOv8 framework using the appropriate package manager (e.g., pip).

Prepare Data: Split the dataset into training and validation sets. Organize the data in the YOLO format, which includes the image path and corresponding bounding box annotations.

- Configure YOLOv8: Customize the YOLOv8 configuration file to suit your specific requirements, such as the number of classes (e.g., helmets, traffic signs) and hyperparameters.
- Train the Model: Start training the YOLOv8 model using the prepared dataset and configuration. Adjust the number of training epochs based on the convergence of the model.
- Evaluate the Model: Once training is complete, evaluate the performance of the trained model using the validation set. Measure metrics such as mean average precision (mAP) to assess the accuracy of helmet detection or traffic sign detection.
- Fine-tuning and Optimization: If the model performance is not satisfactory, consider fine-tuning the model by adjusting the hyperparameters, increasing the dataset size, or applying data augmentation techniques.
- Deployment and Testing: After obtaining a satisfactory model, deploy it to detect helmets or traffic signs in real-world scenarios. Test the model on new images or videos from construction and traffic sites to validate its performance.

2. CONCLUSION

The Safety Helmet-Wearing Detection project successfully achieved its goal of developing a sophisticated system for automatic detection of individuals wearing safety helmets in images and video frames. Leveraging the power of YOLOv8 and Faster R-CNN models, the system demonstrated high accuracy and real-time performance, making it a valuable tool for enhancing safety measures in various environments.

The project's key modules, including image uploading, preprocessing, object detection, and result visualization, functioned seamlessly together, providing users with a user-friendly interface for efficient analysis of safety helmet compliance. The model training process yielded impressive results, with YOLOv8 outperforming YOLOv5 by approximately 2.22%, showcasing the project's commitment to continuous improvement and innovation.

Throughout the development process, security and privacy were given utmost importance, with robust measures implemented to protect sensitive data, models, and user access. Scalability and maintainability were also carefully considered, ensuring the system's adaptability and ease of future updates.

In conclusion, the Safety Helmet-Wearing Detection project is a successful endeavor that addresses the critical need for automated safety helmet compliance monitoring. With its high accuracy, real-time performance, and user-friendly interface, the system can be widely adopted in construction sites, industrial settings, and other environments to minimize safety risks and create safer workplaces.

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