

## Enhancing Workplace Safety: PPE\_Swin—A Robust Swin Transformer Approach for Automated Personal Protective Equipment Detection

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**Abstract:** Accidents occur in the construction industry as a result of non-compliance with personal protective equipment (PPE). As a result of diverse environments, it is difficult to detect PPE automatically. Traditional image detection models like convolutional neural network (CNN) and vision transformer (ViT) struggle to capture both local and global features in construction safety. This study introduces a new approach for automating the detection of personal protective equipment (PPE) in the construction industry, called PPE\_Swin. By combining global and local feature extraction using the self-attention mechanism based on Swin-UNet, we address challenges related to accurate segmentation, robustness to image variations, and generalization across different environments. In order to train and evaluate our system, we have compiled a new dataset, which provides more reliable and accurate detection of personal protective equipment (PPE) in diverse construction scenarios. Our approach achieves a remarkable 97% accuracy in detecting workers with and without PPE, surpassing existing state-of-the-art methods. This research presents an effective solution for enhancing worker safety on construction sites by automating PPE compliance detection.