

AI-Based Helmet Monitoring and Face Recognition System at Building Construction Site: A Survey

Dr.Pradnya.D.Bormane, Amol Shirsat, Sushant Sabale, Harshwardhan Kumbharkar

Department of Artificial Intelligence and Data Science

AISSMS Institute of Information Technology, Maharashtra, India

Abstract: Sites focused on construction projects often draw attention due to their dangers. Ignoring safety protocols can lead to serious injuries or even deaths. A major issue in these environments is the inconsistent use of personal protective equipment, like safety helmets. With the rise of AI and computer vision technologies, automated safety monitoring has become an effective way to reduce incidents and improve site oversight. The study outlines various techniques that use artificial intelligence for visual recognition, mainly to detect helmets worn by workers on construction sites through facial recognition technology. Research in this field is grouped based on how they gather data, which machine-learning algorithms they use for evaluation, and their operational infrastructure—such as clouds, edges, or hybrids. The analysis includes a comparison of common methods like CNNs, YOLO, and Faster R-CNN for detecting helmets. Face recognition systems like FaceNet, ArcFace, and MTCNN are discussed in relation to identity verification. Publicly available datasets, along with annotation methods and assessment criteria, help ensure replicability and establish comparable measurement standards. This study seeks to improve current advancements by identifying gaps in research and suggesting new approaches for developing reliable, privacy-focused, and efficient AI-based surveillance tools specifically for construction sites.

Keywords: Helmet detection, Face recognition, Construction safety, Deep learning, YOLO, Edge AI, Computer Vision

