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# Object Detection In Medical Images Using Yolo

**Ashu Nayak[1], Deepak Kumar Sahu[2], Dr. Ramesh Chander Hooda[3]**
[1]Assistant Professor, Department of CS & IT, Kalinga University, Raipur, India. ku.ashunayak@kalingauniversity.ac.in, 0009-0002-8371-7324
[2]Assistant Professor, Department of Pharmacy, Kalinga University, Raipur, India. ku.deepakkumarsahu@kalingauniversity.ac.in. 0009-0007-2995-1175
[3]Associate Professor, New Delhi Institute of Management, New Delhi, India., E-mail: rc.hooda@ndimdelhi.org, https://orcid.org/0000-0002-0376-2540

***Abstract***
*In real-life scenario, the task of object detection is used in many applications like medical image systems, pedestrian detection and etc. Object detection is the method of identifying objects in the real world using pre-defined object detection approaches. It is a very important task in computer vision tasks. The object detection approach comprises a model database, robust hypothesis, feature detection block, and hypothesis verifier. Feature detection blocks identify the features from the input image. The hypothesis takes the features and searches for candidate objects. The candidate objects are checked against the hypothesis for object class generation. Hypothesis and hypothesis verification blocks link to the model database, which contains the pre-labelled class corresponding objects related to the respective object detection method. The development of an object detection model based on deep learning for medical and non-medical images is the objective. The object detection model was developed based on deep learning. The model was initially tested on non-medical images and subsequently used on medical images. Automated feature selection, extraction, and fusion are essential building blocks for the object detection model, thus making the model appropriate for the detection of medical and non-medical images.*
***Keywords:*** *classification of pressure ulcers, deep learning, object detection, YOLO*

## INTRODUCTION

Non-automated object detection is subjective, but automated object detection is objective. Object detection from medical images is more challenging compared to non-medical images. An end-to-end fully automatic object detection model is required for detecting objects with better accuracy. Anomaly detection is an essential task in medical image processing. Noise, feature extraction, and classification mechanisms are essential factors to be dealt with by any object detection model in order to obtain optimum results [1]. Noise removal is a critical component in the area of digital image processing. Medical images are noise-sensitive. The noise removal method must eliminate the noise without losing important information in the input image. Noise removed images need to be provided to the anomaly detection model to enhance accuracy [2]. Feature extraction is necessary for object classification in an image. Standard automated feature extraction is required to extract the features from the input image. The model must include the essential features to be included in the feature extraction. A classification mechanism will identify the objects based on the extracted features [4]. Thus, an intelligent classification mechanism is needed to detect tumors [9]. Deep learning can learn the features directly from the data rather than relying on handheld engineering techniques, which are not scalable and time-consuming. Deep learning is a part of Machine Learning, a part of artificial intelligence (AI). Early years of AI, AI takes decisions based on well-defined rules formulated by subject experts. AI allows machines to act like humans. AI is appropriate for small data sizes. But the data size is big; it is hard for the experts to formulate the rules. Machine learning algorithms were used at that time to handle big data. Machine learning algorithms can train machines without explicit coding. If the size becomes extremely large, then deep learning algorithms come into existence. Deep learning algorithms primarily rely on neural network algorithms. Deep learning algorithms are properly suitable for problem prediction [3]. Machine learning algorithms break the problem into sub-problems and give the solution.

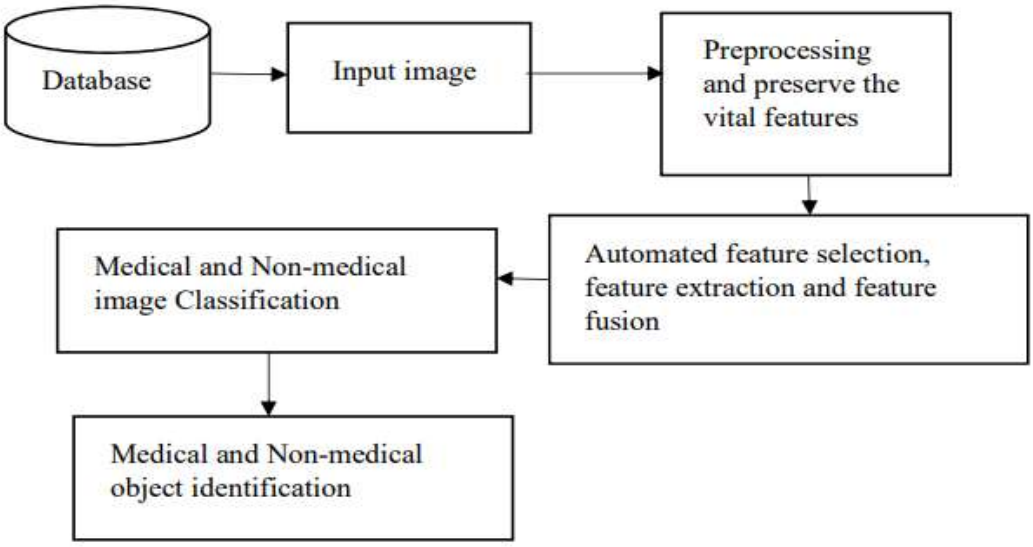


**Figure 1: object detection model**

Deep learning provides the end-to-end solution. To implement deep learning algorithms, there is a need for high-end advanced systems. It requires longer time for training and shorter time for testing data. Deep learning algorithms are modeled after the working of the brain. Artificial neural networks are the fundamental algorithm of deep learning. Subsequently convolutional neural network (CNN or ConvNet) was created, and currently various forms of ConvNet were dominating the Deep learning algorithms. [13].

## MATERIALS AND METHODS

Localized skin and tissue damage brought on by extended pressure or friction are called pressure ulcers, sometimes referred to as bed sores. They are a serious health issue that needs prompt treatment and preventive care, especially for vulnerable groups like the elderly and disabled who spend a lot of time sitting or lying down [5]. Newborns and young children are also at risk for pressure ulcers, albeit to a lesser degree than adults. Particularly among the elderly, who are more vulnerable because to age-related variables such diminished skin integrity, restricted movement, and less sensory awareness, the prevalence is rising[6]. Additionally, extended hospital admissions for neurological conditions, cancer, radiation therapy, complex organ failure, chronic illnesses, long-term intensive care unit stays, and pandemics like COVID-19 increase the incidence of pressure ulcers [10]. Chronic illnesses like obesity, diabetes, and cardiovascular disease are also becoming more common. The majority of these illnesses also put a person at risk for pressure ulcers. Pressure ulcers can form as a result of inactivity, especially in older adults and those with limited mobility [8]. Regular movement and preventive maintenance are crucial since prolonged pressure on particular places can cause tissue damage and ulceration [11].

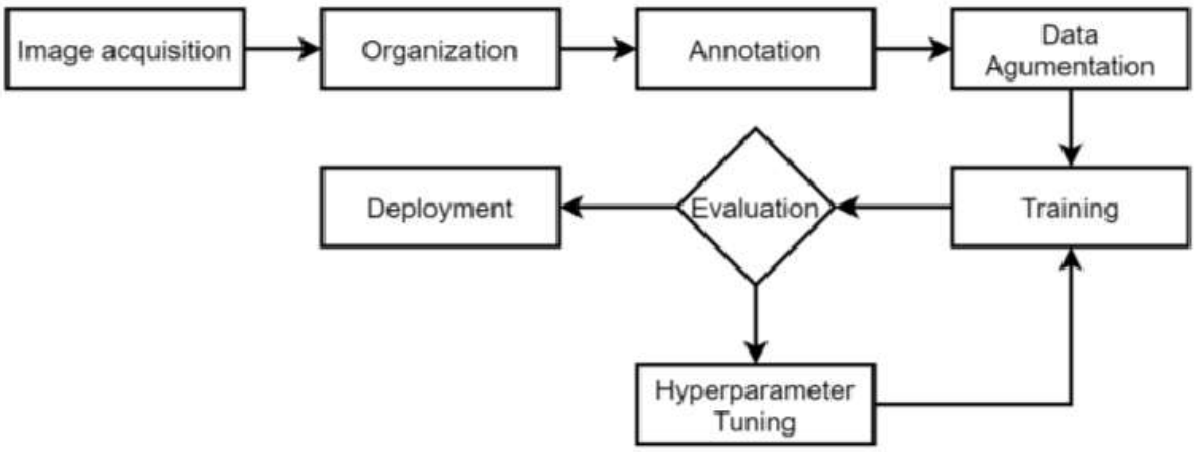


**Figure 1: Yolo architecture (source: web)**

Areas including the ears, elbows, heels, hips, head, shoulders, sacrum, coccyx, and buttocks are frequently affected by pressure ulcers. Patients who have pressure ulcers may experience serious side effects, such as pain, discomfort, and reduced movement, which emphasizes the importance of early prevention and efficient treatment. Prostate cancer's outline and location on magnetic resonance imaging were also determined using YOLO [7].

## RESULT AND DISCUSSION

Qualitative assessment compares the visual effects in the fused image with the respective input image. Multi-focus image fusion retains the crisp and clean features in the fused image. [12].

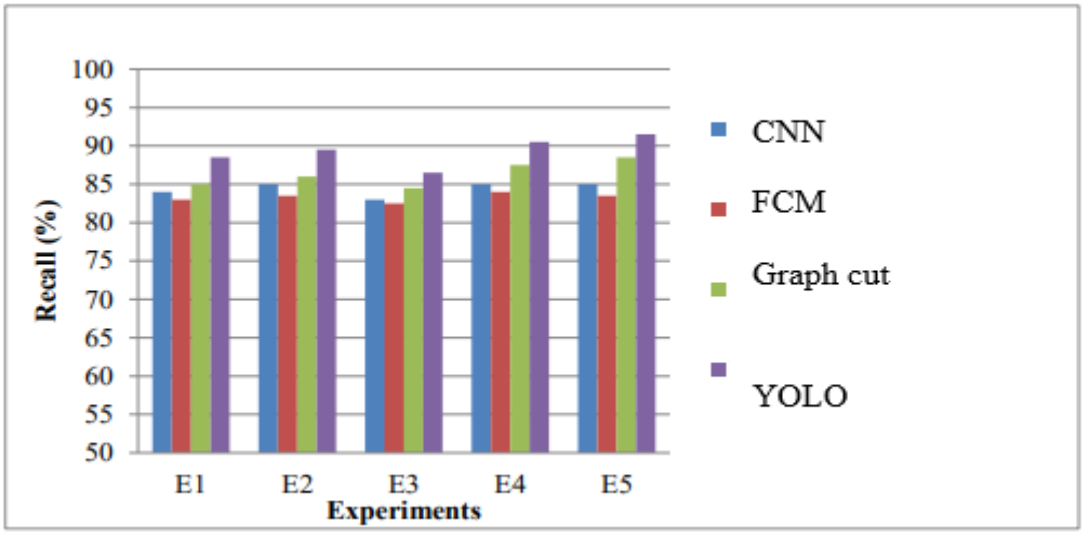


**Figure 2: Performance Analysis Based on Recall**

Fusion of multi-modal medical images is required to retain the characteristic details from various input image modalities. Image fusion of multiple exposure images requires focused attention towards middle exposure features in the input image. The final image appears realistic, thereby facilitating humans in attaining information. Quantitative as well as qualitative measures are adopted for analysis of results.

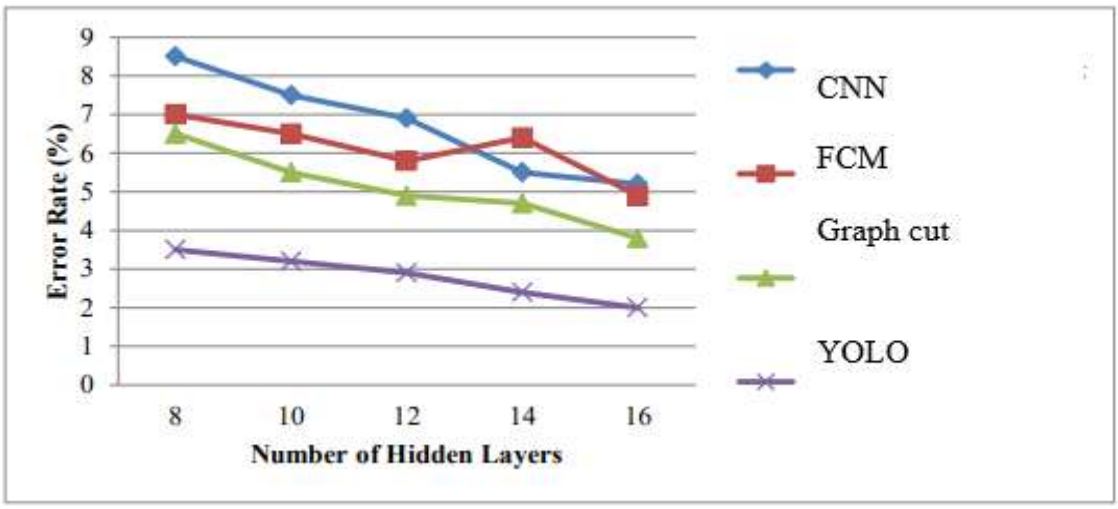


**Figure 3: Performance Analysis Based on Error rate**

All this information has to be blended in appropriate proportion prior to generating the ultimate image. It is performed only by image fusion. The mobile camera images captured are quality dependents on the camera setup, and the image fusion algorithm which blends the images captured by cameras of different modality. All the new capture devices in smartphones employ a series of cameras rather than one single camera to capture photos. So, more details can be recorded from the scene. iPhone snapped a photo and processed the picture.

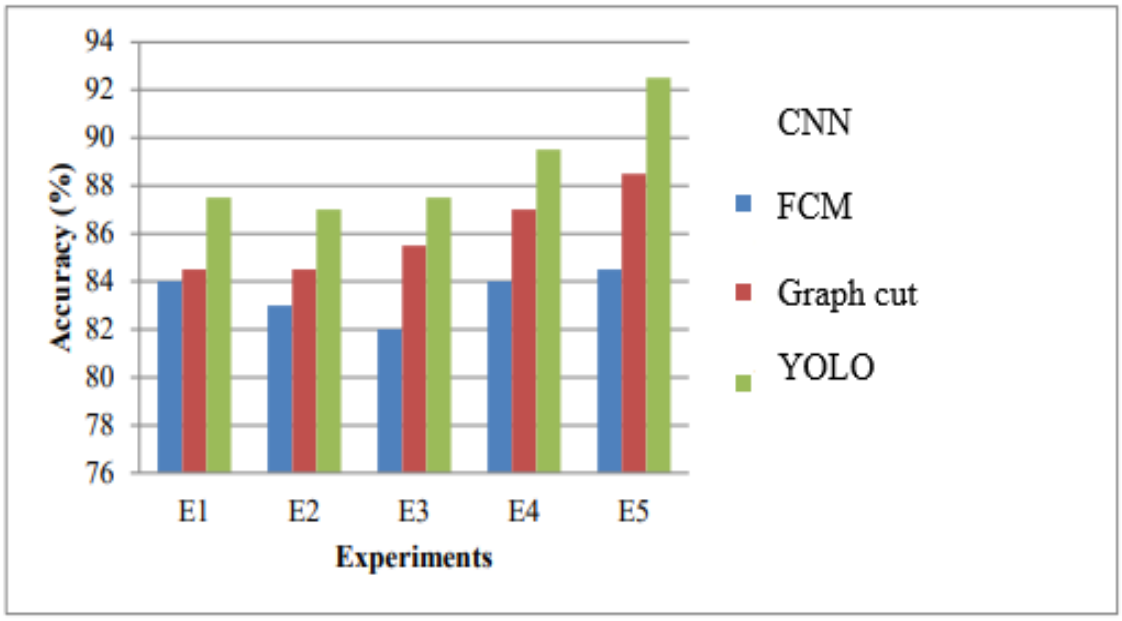


**Figure 4: Recall Comparison Analysis**

A classifier is required for visual recognition, demanding hierarchical, semantic, and informative representations. Common classifiers are SVM, AdaBoost, and the Deformable Part Model (DPM). DPM is adaptable, blending material parts and decompression cost for extreme decompression.

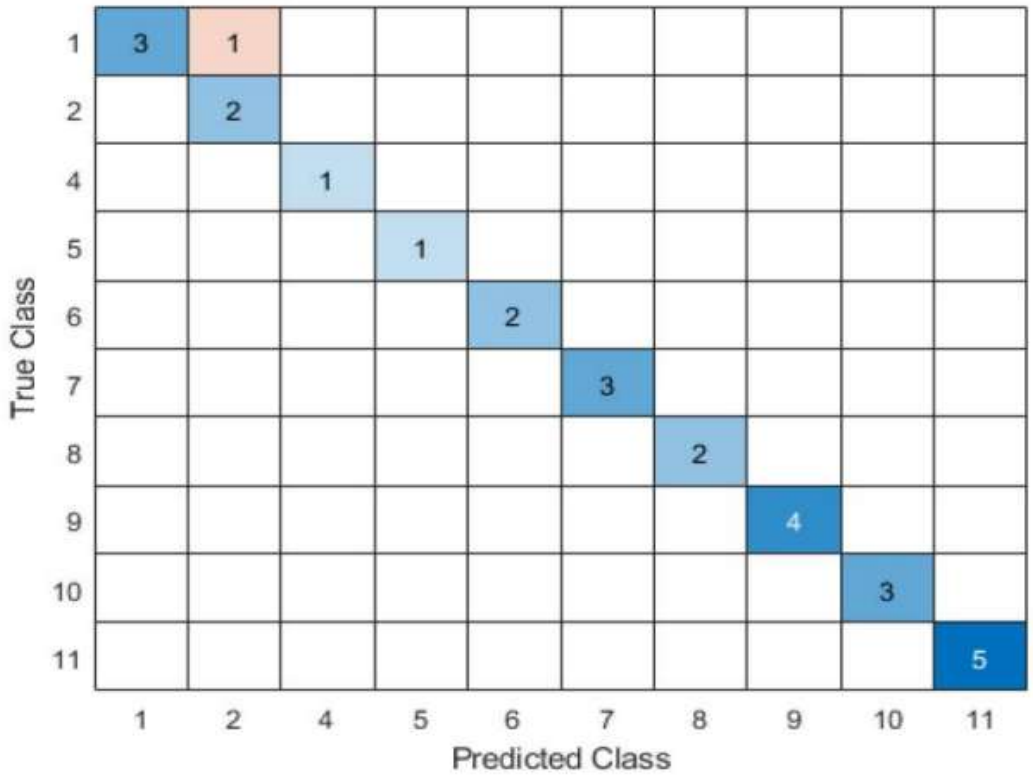


**Figure 5: Confusion matrix for the sample test images**

It employs graphical models, low-level features, and mechanics-inspired partial deformations for discriminative learning, allowing high-accuracy area-based models for different object classes [14]. This proves that the suggested algorithm can be utilized in surveillance applications to identify irregular movements. The technique is challenging when dealing with dynamic backgrounds and camera motion. Moreover, it is challenged with image rotation and scaling, and thus it has the potential of providing inaccurate results when tracking immobile targets for a long period [15].

## CONCLUSION

Nevertheless, pressure ulcer recall was somewhat low as the number of images provided for this class was minimal. The model's performance can be further enhanced by collecting additional pressure ulcer photos. The work shows how deep learning systems can automatically identify and categorize pressure ulcers, allowing for earlier care and possibly improving patient outcomes. Healthcare workers' workloads can be reduced by this technology, freeing them up to concentrate on more important duties. Plans for the future include adding images from different demographics, creating an updated YOLOv5 model trained on a larger, more varied dataset, and investigating transfer learning with previously trained models from other medical imaging datasets.

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