

## **Approach – 1**

Approach-1 is completely innovative, state-of-the-art, and novel. It is based on image processing algorithms or classical algorithms, making it particularly suitable for edge devices, UAVs, or any battery-powered hardware. Unlike other algorithms that rely on frameworks or libraries such as PyTorch, TensorFlow, and other supporting libraries, Approach-1 employs image processing algorithms, which enhances its efficiency and resource-friendliness. In the given task, the video depicts a boxing match between two players. According to standard rules and guidelines, boxing players are required to wear specific colors: one player wears a red outfit and the opponent wears a blue outfit. This standardized dress code is consistent for all matches, ensuring that only players in red and blue outfits are present in the boxing ring. This consistency is a key factor in the development of Approach-1 for player detection. The algorithm detects and tracks the players based on predefined RGB color ranges corresponding to the red and blue outfits of player 1 and player 2. By leveraging these color ranges, the algorithm accurately identifies the players' locations throughout the match. Ultimately, the algorithm generates an output video and a numpy file, capturing the tracked positions and movements of the players.

## **Approach – 2**

As compared to Approach-1, Approach-2 is distinct in its reliance on object detection modules within the domain of computer vision. To perform object detection, any well-known model such as YOLO (You Only Look Once), Faster R-CNN, SSD (Single Shot MultiBox Detector), R-FCN (Region-based Fully Convolutional Networks), or Cascade R-CNN can be utilized. These models can be either pretrained or trained from scratch depending on the availability of datasets. Approach-2 requires more computational resources, as it depends on computationally intensive frameworks like PyTorch, TensorFlow, and other supporting libraries. In contrast, Approach-1 is entirely based on image processing algorithms or classical algorithms, making it more resource-friendly and power-efficient since it does not require additional libraries or frameworks. Consequently, Approach-1 can be easily implemented on edge devices, UAVs, or other hardware where power constraints are critical.

### **Approach-1 vs Approach-2: -**

In the given task, instead of working with Approach-2, a decision was made to develop a novel, state-of-the-art algorithm, leading to the adoption and development of Approach-1. Approach-2 is a common method widely implemented in various applications and use cases, which lacks novelty. Therefore, Approach-1 was pursued and refined to provide results. After fine-tuning, Approach-1 yields more accurate results. Presently, it occasionally misses detecting the bounding box for individuals wearing red-colored dresses, but it performs excellently for those wearing blue-colored dresses, consistently showing bounding boxes along with tracking in each instance or frame.