SHOT NET PRO

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Problem Statement :

1. Develop a convolutional neural network for classification of cricket shots.
2. Compare the performance with shotnet model using different metrics.

1. Introduction :

Cricket is a popular sport in many countries across the world. In recent years, There is a revolution of Technology in the field of Cricket also. With the growth in the application of Artificial Intelligence, Machine Learning has enabled the system to learn the process on their own in order to reduce human labour. Batting is one of the most complicated activities in Cricket, where each batsman plays a different kind of shots according to the cricket pitch. So, we can apply AI techniques in Cricket, which can be of great help to broadcasters in doing automated commentary in near future. It will make their job easier. Therefore, we have developed a Deep Learning model to detect which kind of shot batsman has played . Our model will classify a cricket shot through an image. We use feature extraction for dimensionality reduction. So, we have proposed a SoftMax based CNN and a SVM based CNN model. Later we have compared these two models based on their performance and accuracy. In this paper, we have 4200 images , out of which we have 700 images per shot and out of these 700 images , 600 images are augmented and 100 images are original. Currently, the goal of our developed model is to classify 6 types of cricket shots. On our dataset , the developed model will detect the type of cricket shots and apart from that it will also recognize the similarities and dis-similarities between different cricket shots.

2. Literature Survey :

In recent times, convolutional neural networks incorporated with fully connected layers have achieved state-of-art performance in image classification tasks. The CNN was first proposed by LeCun et al. in 1989. Saad Albavwi et al. [1] explained all the elements and issues related to CNN, their working and stated the parameters which affect CNN efficiency.
The loss functions also hold importance in machine learning. Mohammad Norouzi et al. [7] studies a variety of loss functions and output layer regularization strategies on image classification tasks. They observed meaningful differences in model predictions, accuracy, calibration, and out-of-distribution robustness for networks trained with different objectives. The study identified many similarities among networks trained with different objectives. Different losses and regularizers achieved broadly similar accuracies on CIFAR-10, CIFAR100, and ImageNet. It was found that the choice of loss function affects representations in only the last few layers of the network, which suggests that there are inherent limitations to what can be achieved by manipulation of loss. However, it was also found that different objectives lead to substantially different penultimate layer representations. They found that class separation is an important factor that distinguishes these different penultimate layer representations, and show that it is inversely related to transferability of representations to other tasks. There are some studies [4-6] which incorporated SVM in CNN. Hend Basly et al. [6] used a deep convolutional neural network that offers the possibility of having more powerful extracted features from sequence video frames. The feature vector is then fed to SVM to assign the label (recognise the activity). MSR Daily activity dataset is used for training and evaluation. Yichuan Tang [4] demonstrated the advantage of replacing soft-max layer with linear SVM. The results show that by simply replacing SoftMax with linear SVM gives significant gains on popular datasets, MNIST, CIFAR-10, and the ICML 2013 Representation Learning Workshop's face expression recognition challenge. Abien Fred M. Agarap [5] also did the same thing as [4] i.e., incorporated SVM in place of SoftMax layer. It's well known that if the ML model has access to more data, even if data quality is lower, as long as the useful features can be extracted from the dataset. Data augmentation can be used for this job. Jason Wang and Luis Perez [9] explored the effectiveness of data augmentation techniques. Traditional data augmentation techniques are quite successful. This study experimented with GANs to generate images of different styles. They also proposed a method to allow neural nets to learn the augmentations that best improve the classifier. The model was experimented on various datasets. Applying computer vision techniques in analysis of cricket events is becoming increasingly popular. There are several studies on activity recognition in cricket. Md. Harun-Ur-Rashid et al. [10] proposed a CNN based classification method with Interception-V3 for detection and differentiating waist height no balls with fair balls and achieved a fairly good accuracy. Rohit Kumar et al. [2] built a dataset of different outcomes in cricket (run, dot, boundary, wicket). They used VGGNet for feature extraction which were passed to LSTM to learn the sequence for one video at a time. The

results weren’t much convincing though. Md Nafee Al Islam et al. [8] proposed a CNN model for identifying eighteen different bowlers from seven cricket playing nations based on their bowling action using transfer learning. They also created a dataset of 8100 images for training and evaluating the model. They added a few dense layers on the top of a pretrained VGG16 model trained on ImageNet dataset after removing the output layer. Md Ferdouse Ahmed Foysal et al. [11] proposed a thirteen-layer CNN for classification of different cricket shots. AZM E Chaudhary et al. [3] proposed a different kind of methodology based on motion vector for classifying cricket shots. They defined eight classes of angles to detect cricket shots. The method is focussed on motion vectors which help in measuring the angle of any precise cricket shot.

References :

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