IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

ANALYSIS OF CRICKET SHOT USING SMART VISION DEEP LEARNING

Sakshi Nikumbh ,Ruchita Patel ,Shrawani Bhamare , and Dr. R.C.Samant

Department of MCA (Engg)

Gokhale Education Society's R. H. Sapat College of Engineering ,

T. A. Kulkarni Vidyanagar , college road, Nashik ,MH India-422005

Abstract: In the game of cricket, assessing player performance has become critical for improving skills and strategizing throughout matches. Traditional techniques of shot identification frequently rely on manual observation or rudimentary algorithms, which can be time-consuming and subject to bias. This research provides a better approach for automatic cricket shot recognition based on deep learning, specifically Convolutional Neural Networks (CNNs). The suggested method is intended to classify cricket shots using picture data taken during matches or training sessions. The CNN architecture is trained on a dataset containing photos of various cricket shots, such as drives, cuts, pulls, hooks, and more. The procedure begins with data collection, which involves gathering photos from various sources. Preprocessing techniques are applied to standardize image sizes, enhance contrast, and remove noise, ensuring optimal input for the CNN model.

Overall, the suggested system provides a dependable and automated method for cricket shot recognition, allowing coaches, analysts, and players to obtain useful insights into performance metrics and strategic trends, hence improving cricket training and games.

Keywords: CNN (Convolutional Neural Network), Image Processing, Deep Learning, Computer vision.

1.Introduction

Cricket, one of the most popular sports worldwide, is primarily reliant on player technique and strategy. Understanding and analyzing cricket shots is critical for coaches, players, and analysts seeking to enhance performance and develop winning strategies. Traditional shot detection methods frequently use manual annotation or simple algorithms, which can be time-consuming and subjective. In recent years, the introduction of deep learning techniques, particularly Convolutional Neural Networks (CNNs), has transformed the field of image analysis, opening up new possibilities for automated shot identification in cricket.
This research gives a comprehensive investigation into the use of deep learning, primarily CNNs, for automatic cricket shot recognition. By using the power of neural networks and plentiful visual data, we want to construct a robust and accurate system capable of classifying diverse a variety of precisely timed cricket shots.

The use of deep learning in sports analytics has been made possible by the widespread availability of annotated cricket datasets and high-resolution camera technology. Building on this foundation, our research aims to close the gap between state-of-the-art AI algorithms. The data collection, preprocessing, model architecture design, training, and evaluation are some of the important elements that make up the suggested methodology. In order to provide a comprehensive solution that satisfies the exacting requirements of cricket shot detection, a methodically investigate every facet.

This study is important for reasons that go beyond sports analytics. The proposed system advance the field of computer vision and deep learning applications by showcasing CNNs' effectiveness in cricket shot identification. Our research could also have a significant impact on how cricket is played, taught, and understood. It has practical consequences for cricket teaching, player development, and match analysis.

The image dataset is divided into training, validation, and test sets for the purpose of evaluating the model. Performance is measured using metrics like accuracy, loss, and epoch. After that, a thoroughly trained model is used for real-time shot detection and tuned using methods like model quantization or to maximize inference speed Real-time feedback is provided by the system's integration into an intuitive user interface that overlays detected shot information onto recorded or live video feeds. By gathering fresh data and user input, the model may be continuously improved. This is because the model is retrained and improved over time, guaranteeing its accuracy and robustness.

The subsequent sections cover the methodology, experiments, findings, and comments, providing an explanation of the nuances of our suggested strategy and its consequences for the field of cricket and other areas. The goal is to confirm the efficacy of deep learning in automating cricket shot recognition through thorough experimentation and analysis, and to open up new avenues for future computer vision and sports analytics research.

2.Literature Survey

Sr. No.	Paper Name	Method	Datasets	Size	Measures	Results	Future Scope
1	Automatic Video Summarization from cricket videos using Deep Learning. [Dec 2020] [1]	CNN , RNN , LSTM	Cric Sum	20 videos	F-Score	60.6%	The Potential future studies use other variations of deep modeling to com bine visual and au dio data to create better models.
2	Cricket Gesture Detection using LSTM , Media Pipe and CNN [Oct 2023] [2]	CNN , LSTM	SNOW , custom	30 videos	Accuracy	83.33%	The future scope includes investiga ting different typ es of measureme nts. By combining visual data with o ther methods, suc h as audio or sens or data, scientists can better unders tand crickets.
3	Video Summarization using Deep Learning Techniques : a Detailed Analysis and Investigati on [Mar 2023] [3]	CNN , RNN, LSTM	Image	15 videos	F1 Score	78%	Length Next Whe n using RNN or LS TM for the encod er, the decoder (L ED) and low powe r supply must be considered in VS monitoring. There is still a lot of roo m for improveme

							nt in learning fro m different data.
4	Cricket Shot Detection using 2D CNN [June 2023] [4]	2D CNN	NA	32 images	F1 Score	80%	There is an opportunity to create algorith ms that instantly detect shots duri ng the game, allo wing for instant a nalysis and visuali zation. There is m uch room for imp rovement and de velopment in cric ket batting knowl edge and resourc es used in player development, ma tchmaking and ad vertising. Accumu lated Neural Net work and Gated Recurr ent Unit.
5	CricShotClassif y: An Approach to Classifying Batting Shots from Cricket Videos Using a Convolutional Neural Network and Gated Recurrent Unit [April 2021] [5]	CNN , LSTM, RNN	Cricshot1 0 , novel	NA	F1 Score	81%	The author's plan the order of the o perator and the li mit of the distribu tion affect the sign of the actual multipl e automatic key e xtraction. These p rojects are curren tly being evaluate d for future work. The authors' goal is to present info rmation and creat e custom models with higher accur acy.
6	Cricket Shot Image Classification Using Random Forest [Dec 2021] [6]	Random Forest Algorith m, MediaPip e	Cricket shot image	300 images	F1 Score	87%	As future work, author will focus on direct us er distribution of cricket shot video s and also increasi ng the home colle ction of cricket sh ot images on Peo ple like different boards.

7	Predicting Actions in Videos and Action-Based Segmentation Using Deep Learning [July 2021] [7]	CNN , RNN	UCF11 , KTH	NA	F1 Score	75%	Keyframe extraction algorithm also recommends finding the shooting point in the video and recommends feeding the most important frames in the video to the CNN+RNN network. This not only eliminates duplication of data but also increases the accuracy of predictions
8	ImageNet Classification with Deep Convolutional Neural Networks [2017] [8]	CNNs,	NA	1000	accuracy	45.7%	In this paper ,the author improved the network and trained it for a longer period of time , but they still have many more decisions to work with to non-physically fit the visible flesh of the human body. Finally, they hope to use broad and deep connections between video systems and physical models. Automatic identification and evaluation of players using two-level deep learning network
9.	Automated player identification and indexing using two-stage deep learning network [2023] [9]	(R-CNN)	clock data Start/end time of each play	1 to 99	F1 scores	62%	For future work, the authors plan to improve player discovery by combining data from request frames and adding players whose shirt phone is not visible in some frames due to movement. The c

							ombination of spatial and temporal hierarchical features should be more intuitive for players.
10	A Thorough Survey for Cricket Shot Analysis using Deep Learning [2022] [10]	CNN, DCSN	Cric Sum, novel	300 images	accuracy	80%	This article reviews previous research on cricket batting evaluation that has proven to be very useful in identifying three ways to solve the problem using deep learning. This is the version of the research paper.

Proposed System:

CNNs (Convolutional Neural Networks) is used to design a cricket shot identification system requires a methodical approach with the goal of precisely identifying different cricket shots from images. As per the given image (fig:1 Architecture of System) Firstly, a large dataset of various cricket shots is gathered, with each frame carefully with the appropriate shot. The individual frames from these images are extracted via preprocessing and put into the CNN architecture. Several convolutional layers are usually found in CNN architectures, which are then followed by pooling layers to extract hierarchical features from the input frames. Using CNN models that have already been trained on massive picture datasets such as ImageNet, such as VGG, or Inception, can be an effective way to use transfer learning. The cricket shot dataset is used to fine-tune these models, which helps to adjust the learnt characteristics to the unique subtleties of cricket shots.

The Image dataset is divided into training, validation, and test sets as part of the training process. Using optimization methods like gradient descent and backpropagation, the CNN is trained on the training set. Performance is maximized by fine-tuning the hyperparameters. While evaluation on the test set offers an objective judgment, validation on the validation set aids in keeping an eye on the model's generalization and prevents overfitting. Initially, a large dataset of videos of cricket matches is gathered from multiple sources. This dataset is well annotated and covers a variety of shot types, including drives, cuts, pulls, hooks, and sweeps. Using programs like OpenCV, frames are taken from the films at a steady frame rate and divided into sequences that correspond to distinct shots during the preprocessing stage. Rotation, scaling, and flipping are examples of data augmentation techniques that are used to increase the diversity of the dataset and boost the model's generalization capacity.

The CNN model, which is the system's central component, is made to extract spatial characteristics from the frames. The cricket shot dataset can be used to refine a pre-trained CNN model to maximize its feature extraction capabilities. By analyzing each frame separately, this CNN learns to recognize patterns and characteristics that correspond to various cricket shots. In order to avoid overfitting, the model is trained using label frame sequences, optimized using methods . The model is evaluated using metrics like accuracy, loss, and epoch. For real-time detection, the model is optimized for inference speed and deployed in an environment suitable for live video processing, possibly integrated into a user interface that overlays detected shot information on the video feed. Continuous feedback and retraining with new data ensure the system remains robust and accurate

CNN Algorithm:

Convolutional Neural Network (ConvNet/CNN) is a deep learning algorithm that can take input images and assign values (learn weight and bias) to various features/objects in the image. and having the ability to distin guish one from the other. Convolutional
networks require much less prioritization than other classification algorithms. Although in the first method f ilters are created manually, with sufficient training the convolutional network can learn the filter/features. The architecture of convolutional networks is similar to the structure of connections between neurons in the human brain and is inspired by the organization of the visual cortex. A single neuron responds to stimuli onl y in a limited area of the visual field called the receptive field. The sum of these areas overlaps to cover the entire field of view.

1.Input layer: The layer that provides input to the model. The number of neurons in this layer equals all the features in our data (the number of pixels in the image).

2.Convolutional layer: This layer is used to extract features from the input data. It applies a set of learned filters, called kernels, to the input image.

3.Pooling layer: This layer is periodically deployed in networks, its main function is to reduce the size of the volume, make the calculation faster, reduce memory and prevent overfitting. The two types of tier pooling are maximum pooling and average pooling.

4. Process output: The output of the latent process is then fed to a logistic function (such as sigmoid or softmax) that transforms the output of each category into a function for each category.

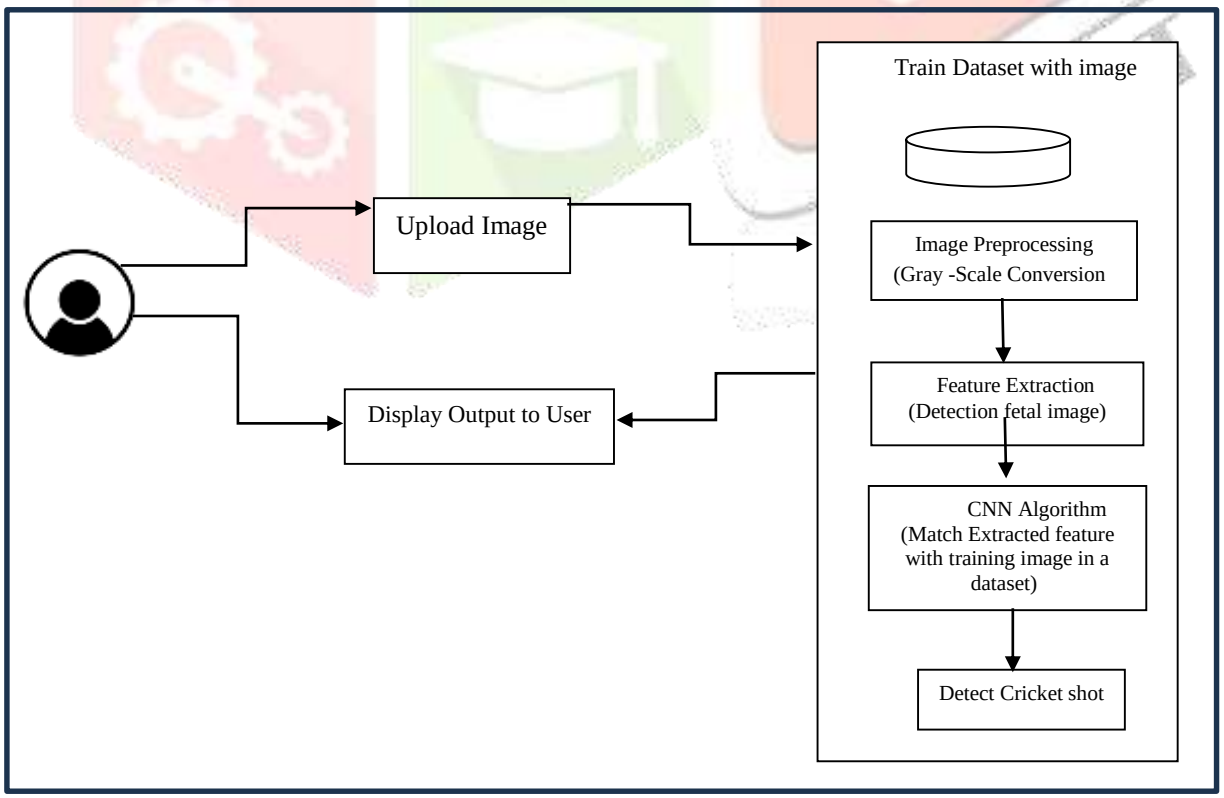


Fig (2): Architecture of System

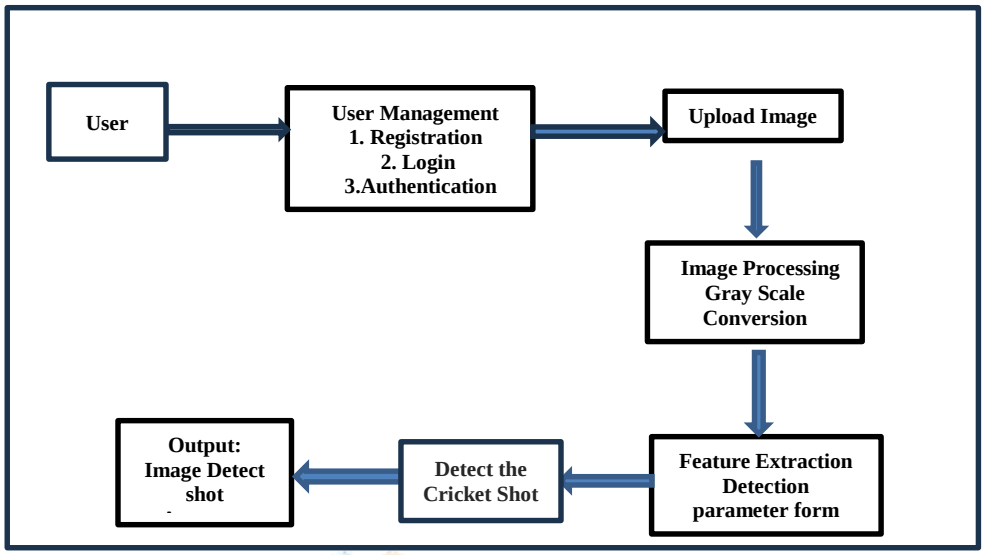


Fig (3): Data Flow of System

Methodology:

1. Data Collection

- Image Data: Collect a large dataset of cricket match image. Ensure the dataset includes various types of cricket shots such as drives, cuts, pulls, hooks, and sweeps.
- Annotations: Label the image with the types of shots being played. This can be done manually or by using existing annotated datasets if available.

2. Data Preprocessing

- Frame Extraction: Extract frames from the images at a consistent frame rate .
- Shot Segmentation: Segment the frames into sequences representing individual shots.
- Data Augmentation: Apply data augmentation techniques like rotation, scaling, and flipping to increase the diversity of the dataset.

3. Model Design

- Convolutional Neural Networks (CNNs): Use CNNs to extract spatial features from individual frames.

4. Training

- Input Representation: Represent each shot as a sequence of frames, with each frame being a matrix of pixel values.
- Loss Function: Use a suitable loss function such as categorical cross-entropy if it's a classification problem.
- Optimization: Use an optimizer like Adam or SGD to train the model.

5. Evaluation

- Metrics: Evaluate the model using metrics such as accuracy, precision, recall, and F1-score.
- Validation: Use a validation set to tune hyperparameters and prevent overfitting.

6. Implementation

- Real-time Detection: Implement the model in a system capable of real-time detection. This involves optimizing the model for inference speed and deploying it in a suitable environment.
- User Interface: Design an interface to display detected shots, possibly overlaying information on live video feeds.

7. Post-processing

- Shot Classification: Classify detected shots into predefined categories.
- Feedback Loop: Continuously improve the model by collecting feedback and retraining with new data.

Results:

Fig (4): Home Page

This is System Home page as per fig (4).

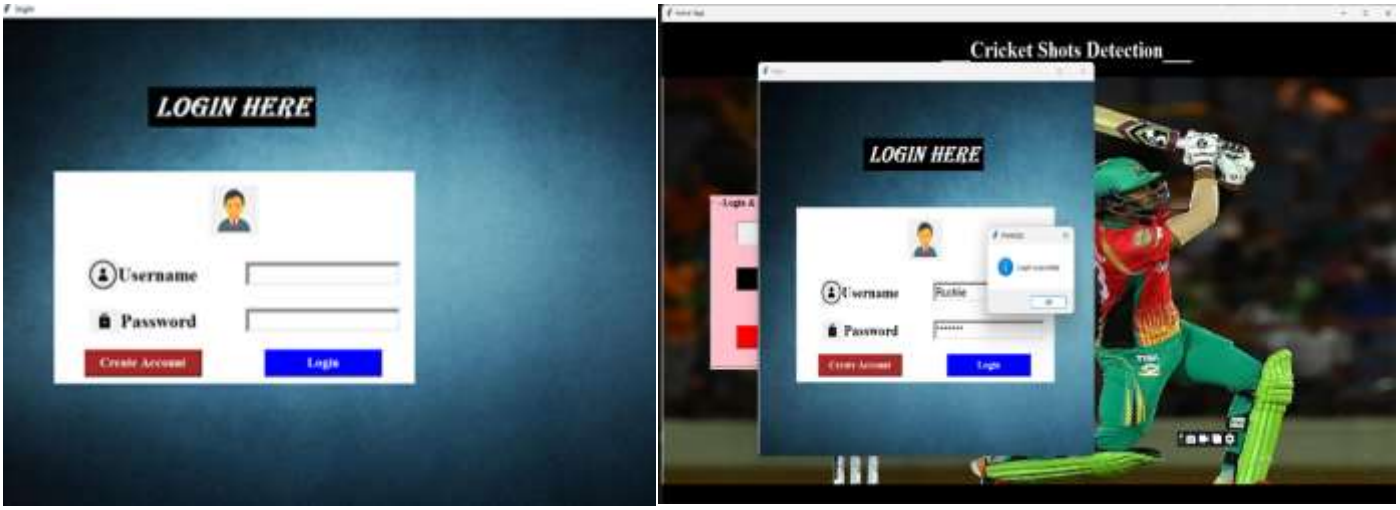
It represent the Graphical User Interface (GUI) which show the GIF (Graphic Interchange format) which contain more than more frame. This page contains 3 buttons Registration button ,Login button, Exit Button.

(a) **(b)**

Fig(5): Registration Page

This is Registration page as per Fig(5.a).Firstly the user has to click on Registration button and enter valid information (name, email, password ,gender) according to validation of username and password as uppercase ,special character, numeric values. After entered valid information user has to click on Register

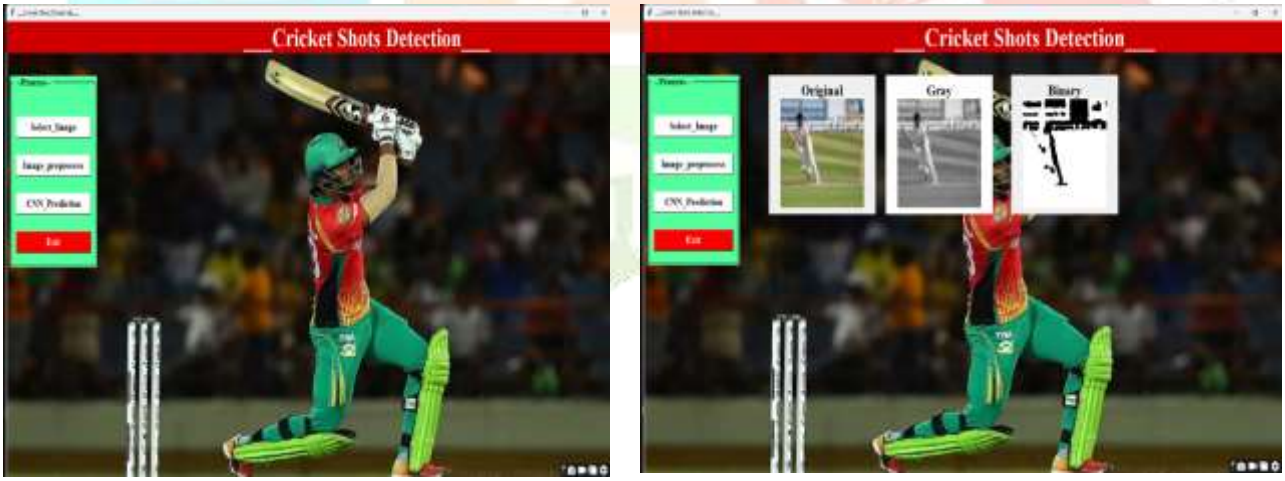
Button ,as per Validation the information is valid then message is display on screen “Account Created Successfully”.



(a) (b)

Fig (6): Login Page

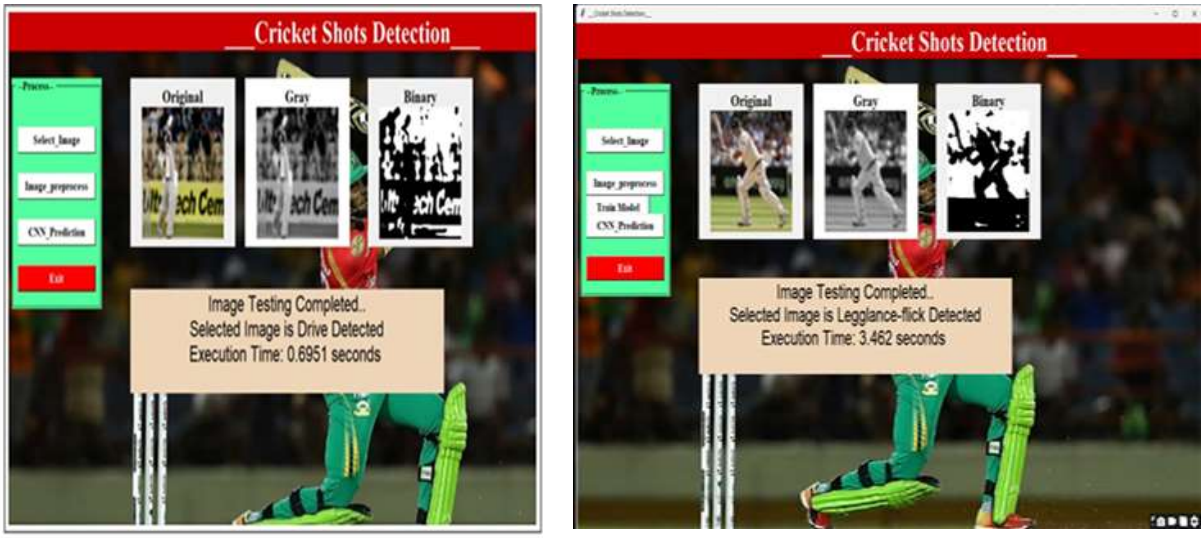
This is Login Page as per Fig (6.a). After Registration user has to click on Login button and entered valid username and password to Login in. The entered username and password is correct then message is display on screen as per Fig(6.b) “Login Successfully”.



(a) (b)

Fig(7) :Image Preprocessing using CNN

This image(7.a) represent CNN Model page which contains 4 buttons (Select image, Image preprocess, CNN predication ,Exit) .As per Fig (7.b) firstly user has to select image from dataset (cricket shot image) and click on image preprocess that converts original image into Gray scale as well as Binary Scale .

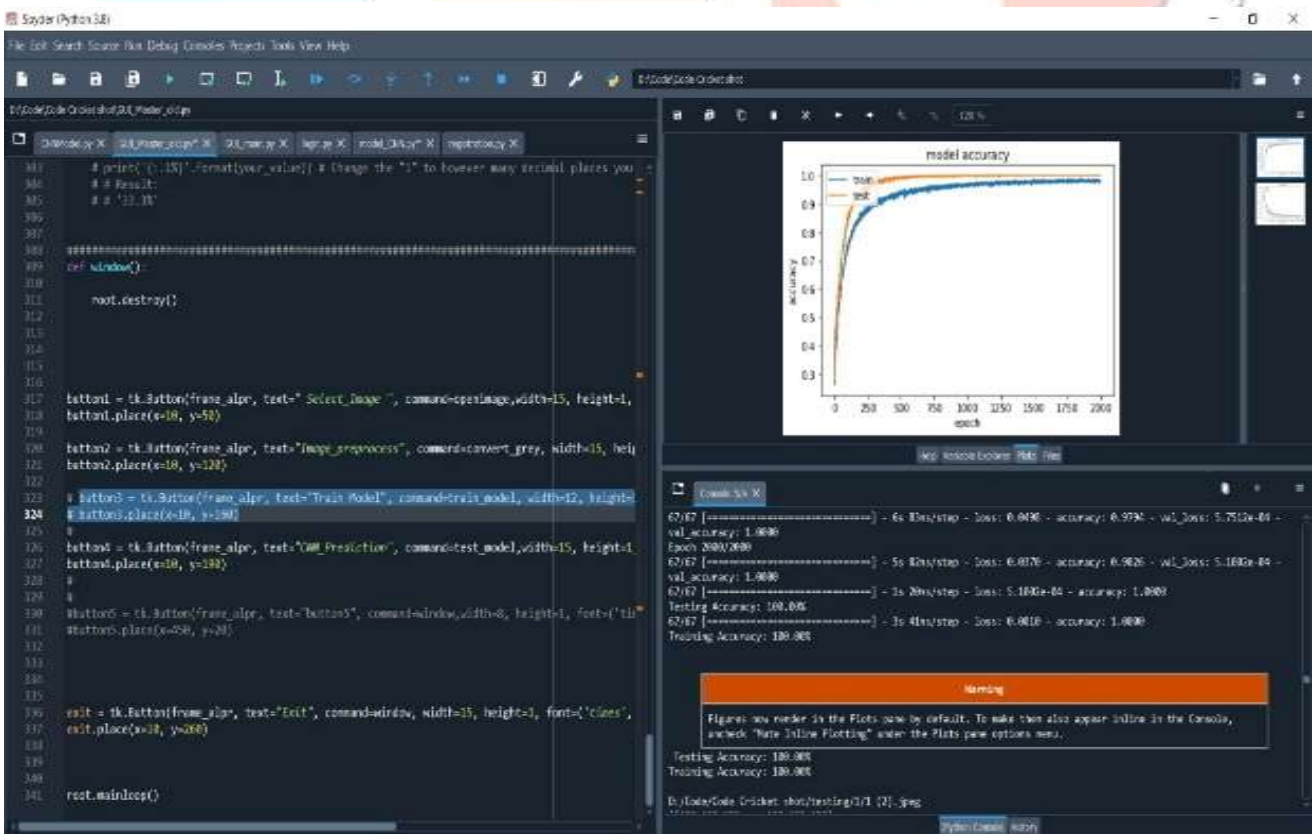


(a) **(b)**

Fig(8) :Cricket Shot Detection

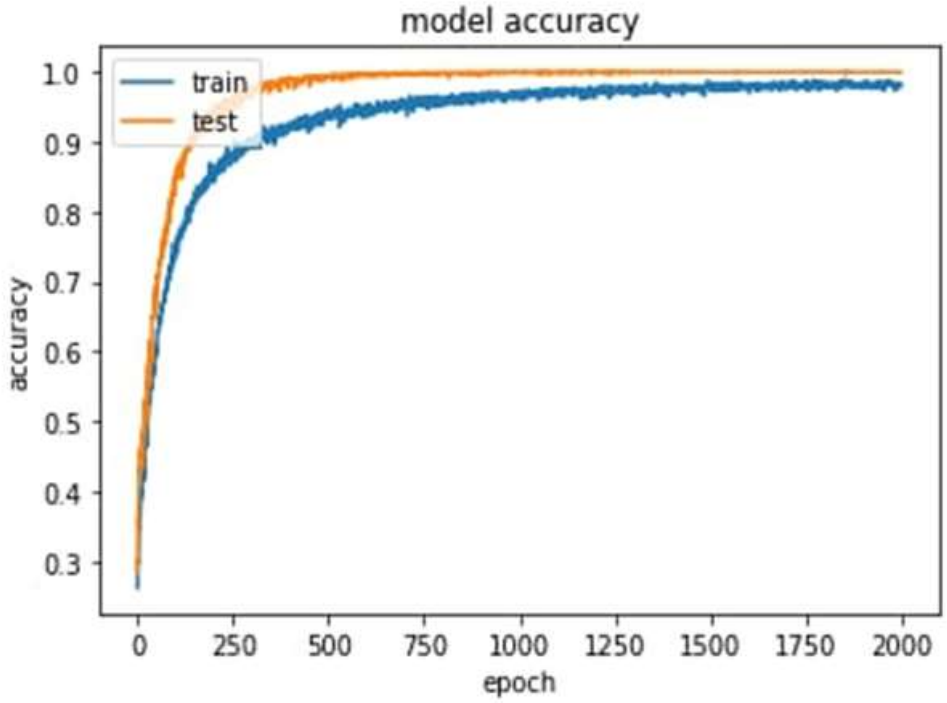
As per Fig (8.a) After preprocessing the image into binary scale as well as Gray Scale conversion it extract noise or irrelevant feature from image. Then user has to click on CNN-predication button it predict the shot on the bases of batsmen position such as (drive ,pull, legglance -flick ,Coverage).

The Dataset Cricket shot image contain 2000 datasets For Training as well as Testing. Training starts at the backend of the code and tesing has been done at the frontend of the code. Testing is completely depend on training datasets. If training is done properly, then it detects the shot accurately while testing.



(a)

Fig (8.1): Accuracy of datasets



(b)

Fig (8.1): Accuracy of datasets

The fig:(8.1.a) represents accuracy of model between training and testing of 2000 datasets. It shows execution time, loss, accuracy, val_loss and val_accuracy and it also represents training accuracy 100% .The Graph of Model accuracy of training and testing has shown in fig:(8.2.b).

Future Scope:-

One potential Future direction is to improve the accuracy of detected shots with the ongoing trend of the cricket matches like T20, various high risk shots are now being played. We plan to include these high risk shots as well as digital camera which helps to detect cricket shot in live matches. The Future research is to improve the accuracy and robustness of the system in challenging conditions. This could be achieved by exploring advanced pre-processing techniques, such as contrast enhancement and image de- noising, or by developing more sophisticated deep learning models.

Conclusion:-

In conclusion, cricket shot detection is a method used to identify and analyze different types of shots played by a batsman in a cricket match. This technique utilizes advanced technology like deep learning and computer vision to recognize various shot patterns from Image. Using deep learning for cricket shot detection is a game-changer. It means computers can now recognize and understand the different types of shots players make in cricket matches. This is not only exciting for fans but also incredibly useful for coaches and players. They can use this technology to analyze the game better and improve their skills and strategies.

Reference:

1.Solayman Hossain Emon , A.H.M Annur, Abir Hossain Xian, Kazi Mahia Sultana, Shoeb Mohammad Shahriar , “Automatic Video Summarization from Cricket Videos Using Deep Learning”, 2020. https://ieeexplore.ieee.org/document/9392707

2.Vijay Kumar , Manan Pruthi, Ashish Katyal , Sanyam, Rishabh Semwal,
“ Cricket Gesture Detection using LSTM , Media Pipe and CNN”,2023.

https://www.researchgate.net/publication/374673576_Cricket_Gesture_Detection_Using_LSTM_Media_Pipe_And_CNN

3. Parul Saini, Krishan Kumar, Shamal Kashid, Ashray Saini, and Alok Negi, "Video Summarization using Deep Learning Techniques : a Detailed Analysis Investigation" ,2023.
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10015543/

4.Ohn Bennilo Fernandes, Pandiri Sai Ram, Pandanaboina Madhu Varshith Yadav, Karur Pavan Kumar, " Cricket Shot Detection using 2D CNN",2023.
https://ieeexplore.ieee.org/document/10142272

5.Anik Sen ,Kaushik Deb ,Pranab Kumar Dhar ,Takeshi Koshiba,"CricShotClassify: An Approach to Classifying Batting Shots from Cricket Videos Using a Convolutional Neural Network and Gated Recurrent Unit"2021.
http://researchgate.net/publication/350998665_CricShotClassify_An_Approach_to_Classifying_Batting_Shots_from_Cricket_Videos_Using_a_Convolutional_Neural_Network_and_Gated_Recurrent_Unit

6.Mithelan Devanandan,Vithurson Rasaratnam,Manoj Karthik Anbalagan ,Janani Tharmaseelan"Cricket Shot Image Classification Using Random Forest"2021
https://www.researchgate.net/publication/357762494_Cricket_Shot_Image_Classification_Using_Random_Forest#:~:text=We%20develop%20a%20Random%20Forest

7. Fayaz A. Memon,Umair A. Khan,Asadullah Shaikh, Abdullah Alghamdi, Pardeep Kumar, Mesfer Alrizq"Predicting Actions in Videos and Action-Based Segmentation Using Deep Learning"2021.
https://ieeexplore.ieee.org/document/9500219

8. PictureAlex Krizhevsky, PictureIlya Sutskever ,PictureGeoffrey E. Hinton,"ImageNet classification with deep convolutional neural networks"2017.
https://dl.acm.org/doi/10.1145/3065386

9. Hongshan Liu, Colin Aderon, Noah Wagon, Abdul Latif Bamba, Xueshen Li, Huapu Liu, Steven MacCall, Yu Gan"Automated player identification and indexing using two-stage deep learning network"2023.https://arxiv.org/abs/2204.13809

10. A Thorough Survey for Cricket Shot Analysis Using Deep Learning
Atharv Pushkraj Nirgude , MESCOE,PUNE; Rohit Dinesh Sonone, MESCOE,PUNE; Sahil Vikram Sonawane, MESCOE,PUNE; Rushikesh Sham Ahire, MESCOE,PUNE; Prof. Balaji Bodkhe, MESCOE,PUNE .2022
https://www.ijsrd.com/Article.php?manuscript=IJSRDV10I20138