A

Synopsis

On

“Cricket PoseNet : AI Shot Recognition”

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Table of Contents

INTRODUCTION

This project is dedicated to the precise classification of cricket shots, employing cutting-edge technologies like Detectron2 and Deep Learning within the realm of advanced computer vision. A fundamental aspect of Computer Vision, known as Pose Detection, assumes a pivotal role in this endeavor. It involves the sophisticated prediction of the positions and postures of individuals or objects captured within images. The primary aim of this undertaking is to categorize cricket shots based on the specific poses adopted by players in the images. This entails discerning not only the spatial arrangement but also the orientation of the players in the frame. By harnessing the combined capabilities of Pose Detection and Deep Learning, we unlock the ability to not only identify the type of cricket shot being executed but also to derive invaluable insights for cricket analysis and training. It's akin to having a perceptive eye that can instantly recognize and categorize a wide array of cricketing actions.

This project employs a multi-faceted approach, encompassing deep learning methodologies, extensive data augmentation techniques, and rigorous model training procedures. This ensures that the model becomes adept at generalizing across various player poses and shot types. Through these techniques, the model achieves a high level of proficiency in recognizing and classifying cricket shots with a remarkable degree of accuracy. Ultimately, this project aspires to yield a robust and automated solution for cricket shot classification, poised to offer indispensable support for coaches, analysts, and cricket enthusiasts seeking profound insights into the game.

OBJECTIVE

The project's core objective is to automate the classification of cricket shots using player poses in images. Manual shot classification is time-consuming and subjective. To address this, we'll create a robust model leveraging player poses for accurate categorization. This involves assembling a diverse dataset of cricket shots, applying data augmentation techniques for model versatility, and using the Detectron2 library for precise pose detection. We'll develop a function for extracting and formatting pose keypoints, ensuring efficient model training.

The neural network architecture will be carefully designed, and the model will be trained on the extracted features and shot labels. Rigorous evaluation will focus on the model's accuracy in classifying shots based on player poses, ensuring reliable performance on unseen data. This automated solution will revolutionize cricket analysis and coaching by providing objective shot classification, reducing time and subjectivity in the process. It will empower coaches and analysts to make data-driven decisions, enhancing player performance evaluation. Additionally, the model's adaptability to various shot types and player orientations makes it a valuable tool for cricket enthusiasts and analysts worldwide.

MOTIVATION

The motivation behind this project arises from the desire to leverage advanced computer vision techniques for enhancing cricket analysis and training. Several key factors drive the need for a cricket shot classification system based on player poses:

Performance Analysis : Cricket is a highly strategic and competitive sport where the type of shot played by a batsman can significantly impact the outcome of a match. Coaches, analysts, and players seek a tool that can accurately classify these shots to assess player performance and strategize effectively.

Training Enhancement : For aspiring cricketers, understanding shot selection and technique is crucial for improvement. An automated system that can provide real-time feedback on the type of shots played can be a valuable training aid.

Data-Driven Insights : Cricket teams and analysts are increasingly relying on data-driven insights to gain a competitive edge. Shot classification based on player poses provides a new dimension of data that can be used for in-depth performance analysis and decision-making.

Automation : Manually classifying cricket shots from videos or images is a time-consuming task. Automation through computer vision reduces the workload and provides consistent and accurate results.

Technological Advancements : With the availability of powerful Deep learning and computer vision tools, there is a growing opportunity to develop sophisticated systems that can analyze cricket shots with a high degree of accuracy.

In summary, the motivation behind this project is to create a practical and valuable tool for the cricket community, including players, coaches, analysts, and enthusiasts. It aims to bridge the gap between technology and cricket analysis, offering a data-driven approach to shot classification that can enhance performance assessment and training in the sport.

HARDWARE AND SOFTWARE REQUIREMENTS

Software Requirements

- **Operating System :** x86/x64 based OS (Windows/Linux)
- **Language/Technologies Used :** Python, Numpy ,Pandas.
- **IDE Used :** VS Code, Jupyter Notebook.
- **Python version (Recommended):** 3.9
- **Modules:**
    - **Detectron2 :** Detectron2 is an open-source deep learning framework for computer vision tasks, particularly focused on object detection, instance segmentation, and related tasks.
    - **OpenCv:** OpenCV now supports a multitude of algorithms related to Computer Vision and Machine Learning and is expanding day by day.
    - **Numpy:** NumPy is a module for Python. This makes sure that the precompiled mathematical and numerical functions and functionalities of Numpy guarantee great execution speed.
    - **Pytorch :** PyTorch is an open-source deep learning framework developed by Facebook's AI Research lab (FAIR). It is primarily used for building and training deep neural networks for a wide range of artificial intelligence and machine learning tasks.

Hardware Requirements

- **RAM :** 8 GB RAM or higher
- **Disk Space :** 64 GB Recommended

METHODOLOGY USED

The methodology used in the development of the Cricket Shot Classification System involves a combination of software development and machine learning practices. Below is an overview of the methodology:

Agile Software Development

The project adopts Agile methodologies, specifically Scrum, to ensure flexibility and adaptability throughout the development process. Agile practices allow for iterative development, frequent feedback from stakeholders, and the ability to accommodate changing requirements. The development process is divided into sprints, typically of two to four weeks, during which specific features or functionalities are developed and tested.

Machine Learning and Deep Learning

Machine learning techniques are a core component of the methodology, especially for the task of pose detection and shot classification. The project utilizes deep learning frameworks, such as PyTorch, and pre-trained models (e.g., Detectron2) for efficient pose detection. Transfer learning may also be applied to fine-tune models for shot classification based on labeled data.

Data Collection and Annotation

A substantial part of the project involves data collection and annotation. High-quality datasets of cricket players in various shot positions are collected, labeled, and used for training and testing machine learning models. Data augmentation techniques may be applied to enhance the diversity and size of the dataset.

Model Development and Training

Machine learning models for pose detection and shot classification are developed and trained using the collected data. The project may employ state-of-the-art deep learning architectures suitable for the tasks. Model training involves optimizing hyperparameters, loss functions, and model architectures for accurate shot classification.

User Interface Development

The user interface (UI) for the Cricket Shot Classification System is developed using web development frameworks (e.g., React). The UI allows users to interact with the system by uploading images and viewing shot classification results. The UI design follows best practices for usability and user experience.

Testing and Quality Assurance

Testing is an integral part of the methodology. Various types of testing, including unit testing, integration testing, and acceptance testing, are performed to ensure the correctness and reliability of the system. Continuous integration and continuous testing practices are employed to maintain code quality.

Deployment and Scalability

The system is deployed on appropriate server infrastructure, considering factors like performance and scalability. It is configured to handle concurrent user requests efficiently. Load testing may be conducted to assess system performance under different levels of load.

Project Management

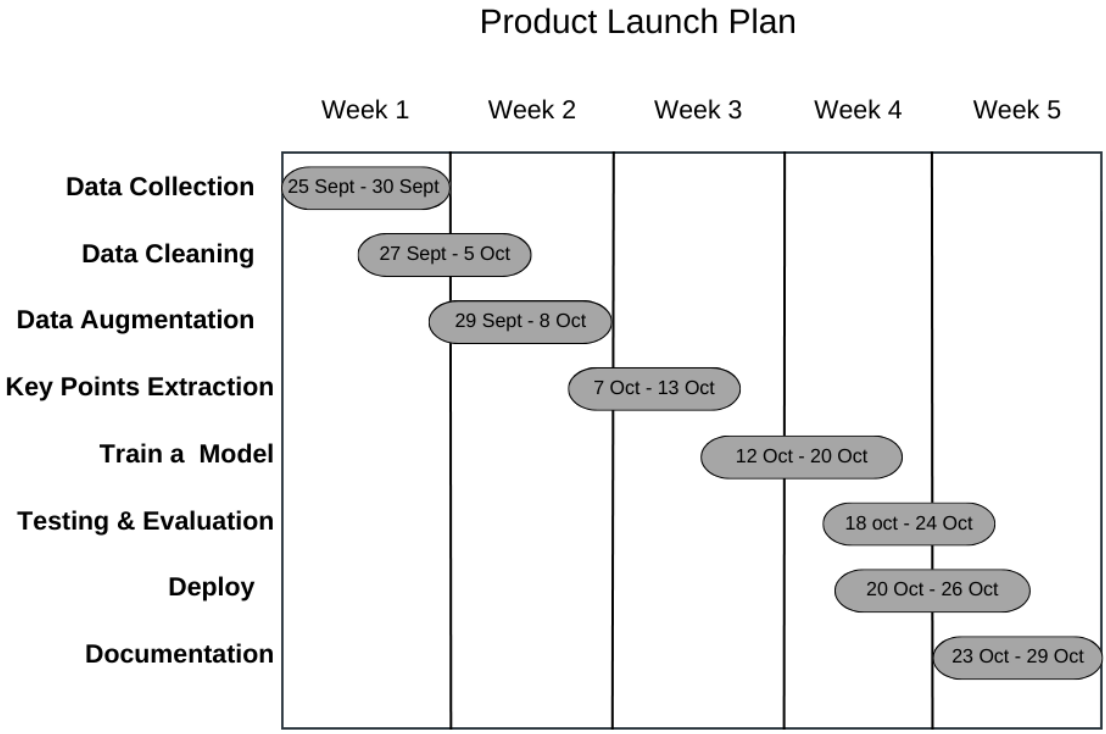
Project management practices, including sprint planning, backlog management, and regular review meetings, are employed to ensure that the project stays on track, deadlines are met, and resources are allocated effectively.

The combination of Agile development practices and machine learning techniques ensures that the Cricket Shot Classification System is developed in an iterative, collaborative, and data-driven manner. This methodology allows for the creation of a robust and accurate system that meets the needs of cricket enthusiasts and analysts.

GANTT CHART

Creating a Gantt chart for a project like the Cricket Shot Classification System can be a valuable visual tool for project management and scheduling. Here's a simplified Gantt chart for the project, outlining key tasks and their estimated durations. Please note that this is a simplified representation, and actual task durations may vary based on project specifics.

For the Backend Work :



Gantt Chart

Please note that task durations are approximate, and dependencies between tasks may impact the actual schedule. The Gantt chart provides a high-level overview of the project timeline and can be used for tracking progress and adjusting the schedule as needed throughout the project's lifecycle.

CONCLUSION

In conclusion, the development of Cricket Posenet : AI Shot Recognition has been an exciting journey fuelled by our deep passion for cricket and commitment to delivering an exceptional online cricket experience. We successfully implemented pose detection using state-of-the-art deep learning models. This allows us to accurately analyze the posture and positions of cricket players in images.Leveraging the pose data, we developed a shot classification system capable of categorizing cricket shots with a high degree of accuracy. This system provides valuable insights for cricket enthusiasts, coaches, and analysts.

The user interface (UI) of the system provides an intuitive platform for users to upload images and receive shot classification results. Comprehensive documentation has been maintained, ensuring that knowledge about the system's architecture, operation, and maintenance is readily available.

FUTURE WORK

Extend the system to perform real-time shot classification during live cricket matches. Continue to collect and annotate diverse datasets to improve the model's accuracy. Explore more advanced deep learning architectures. Optimize the system's performance, especially for handling a large number of user requests simultaneously. Develop a mobile application for on-the-go shot classification. Integrate the system with cricket analytics tools to provide in-depth insights into player performance and strategy. Apply similar techniques to classify shots or actions in other sports.

The Cricket Shot Classification System has the potential to revolutionize cricket analysis and provide valuable information to players, coaches, and fans. Continuous research, development, and user feedback will drive its evolution and success in the future.

REFERENCES

Certainly, here are some references that can be used for the development and research related to the Cricket Shot Classification System:

[1] Foysal, Md. Ferdouse & Islam, Mohammad & Karim, Asif & Neehal, Nafis. (2018). ShotNet: A Convolutional Neural Network for Classifying Different Cricket Shots. https://www.researchgate.net/publication/328189966_ShotNet_A_Convolutional_N eural_Net work_for_Classifying_Different_Cricket

[2] https://detectron2.readthedocs.io/en/latest/tutorials/install.html

Additionally, consider consulting academic journals and research papers for more specific and up-to-date information on computer vision, machine learning, and sports analytics in cricket.