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'A Comprehensive A Review of Basketball Shooting Analysis Based on Artificial Intelligence'

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CANDIDATE DECLARATION

I hereby declare that the work, which is being presented in the **Seminar (8AM7-40)**, entitled **"A Comprehensive A Review of Basketball Shooting Analysis Based on Artificial Intelligence"** in partial fulfillment for the award of Degree of **"Bachelor of Technology"** in Department of **Artificial Intelligence and Machine Learning, Mahila Engineering College, Ajmer, Bikaner Technical University, Bikaner** is a record of my own investigations and experiments carried under the Guidance of **Dr. S.K. Agarwal, Assistant Professor, ECE**. I have not submitted the matter presented in this report anywhere else for the award of any other degree.

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CERTIFICATE

This is to certify that Sharvani Gautam of VIII semester, B.Tech (Artificial Intelligence and Machine Learning) session 2024-25 has presented a seminar report titled **"A Comprehensive A Review of Basketball Shooting Analysis Based on Artificial Intelligence"** in partial fulfilment for the award of the degree of Bachelor of Technology under Bikaner Technical University, Bikaner.

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ABSTRACT

Artificial Intelligence (AI) is revolutionizing basketball shooting analysis by enhancing accuracy, technique, and player performance. AI-driven technologies help identify shooting postures, analyze ball trajectories, predict free throw success, and provide intelligent corrections for shooting errors. By leveraging data from sensors and cameras, AI can break down shooting mechanics and offer valuable insights for athletes and coaches.The AI process involves multiple stages, starting with data collection and preparation, where shooting movements and ball trajectories are recorded. Feature extraction is then used to identify key elements such as hand positioning, release angle, and shot consistency. AI models are trained using this data to recognize patterns and improve shooting techniques. Performance evaluation ensures that AI-generated feedback remains accurate and effective in both training and real-game scenarios.While AI offers significant advantages, including personalized training and real-time feedback, it also faces challenges such as the need for high-quality data, computational power, and integration with traditional coaching methods. However, continuous advancements in AI and biomechanics are addressing these limitations, making AI-powered shooting analysis increasingly effective. Future developments in AI for basketball shooting analysis may include deeper integration with biomechanics to enhance the understanding of shooting mechanics, real-time AI coaching tools adaptable to live training and games, and personalized shooting improvement systems tailored to individual players. These innovations will not only improve basketball training but also expand the role of AI in sports, helping athletes maximize their potential.

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Chapter 1

Introduction

1.1 Background

Basketball is a sport where precision, consistency, and technique can drastically influence the outcome of a game. Among the many skills involved, shooting stands as one of the most vital. Whether it's a free throw, jump shot, or a three-pointer, a player's ability to consistently deliver accurate shots plays a significant role in their overall performance and impact on the team. Traditionally, shooting technique has been improved through repeated practice and guidance from coaches. However, this approach has limitations in terms of subjectivity, time, and the ability to analyze micro-level biomechanics. The growing role of technology in sports has opened new avenues for performance enhancement. Among these, Artificial Intelligence (AI) has emerged as a game-changing force.

1.2 The Rise of Artificial Intelligence in Sports

AI is transforming how athletes train, coaches strategize, and fans engage. From match prediction to injury prevention, AI's capabilities in analyzing large datasets and detecting patterns have become increasingly important. In basketball, one of the most innovative applications of AI is in shooting analysis — a domain that requires real-time feedback, pattern recognition, and biomechanical understanding.

By analyzing the movements of players during shooting — including arm angle, wrist positioning, jump height, and ball release timing — AI systems can generate insights that were previously impossible to identify manually. These insights not only help in correcting errors but also in personalizing training regimens.

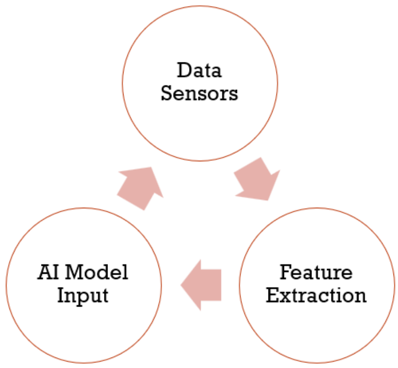

Figure 1.1: Collecting and processing phases

1.3 Objective

This report explores the role of AI in basketball shooting analysis. It delves into the technologies used, the methodology of AI-based analysis, its benefits and limitations, and the future scope of integrating AI with traditional coaching methods. The aim is to provide a comprehensive understanding of how AI can revolutionize basketball shooting and enhance player performance.

1.4 Structure of the Project

The report is divided into multiple chapters, each focusing on a specific aspect of AI in basketball shooting:

Fundamentals of basketball shooting

- **Fundamentals of basketball shooting.**
- **AI technologies used in motion analysis.**
- **Data collection and feature extraction.**
- **Machine learning models and evaluation.**
- **Real-time feedback mechanisms.**
- **Challenges, limitations, and future prospects.**

Chapter 2

Fundamentals of Basketball Shooting

2.1 Types of Basketball Shots

Understanding AI in shooting analysis requires a fundamental knowledge of the different types of basketball shots and the mechanics behind them:

- **Free Throw:** A stationary shot taken from the free-throw line, which is 15 feet from the basket.Requires accuracy and consistency, as there is no movement involved.The shooter must focus on proper shooting form, including balance, alignment, and follow-through.
- **Jump Shot:**Taken while jumping, this shot requires synchronization of leg, arm, and hand movements.The shooter must explosively jump off the ground, extending their arm and releasing the ball at the peak of the jump.Proper shooting form, including balance, alignment, and follow-through, is crucial for a successful jump shot.
- **Three Point Shot:** A long-distance shot beyond the arc, which is 23 feet, 9 inches from the basket.Requires power and precision, as the shooter must generate enough force to overcome the distance.The shooter must also account for air resistance and the curvature of the ball as it travels through the air.
- **Layup and Hookup Shot:** Close-range shots often taken under pressure.

Layup: A shot taken while driving to the basket, where the shooter uses a combination of speed and agility to get past defenders.

Hook Shot: A shot taken with a hooking motion, where the shooter uses their wrist and forearm to generate power and control. Both shots require quick decision-making and precise execution to succeed.

2.2 Key Biomechanical Elements

Shooting is a complex biomechanical task involving coordination between various body parts. The most critical components include:

- **Foot Positioning:** Stability starts from the ground. A shoulder-width stance provides balance.
- **Knee and Hip Alignment:** Acts as a spring for upward motion.
- **Elbow and Wrist Mechanics:** Existing solutions lack flexibility in formatting and exporting transcriptions to meet specific user needs.
- **Follow Through:** Proper elbow alignment ensures directional accuracy, while wrist flick contributes to the ball's rotation and arc.

2.2.1 Common Errors in Shooting

Common Errors in Shooting Even skilled players often face issues in shot execution. Common errors include:

- **Incorrect elbow placement**
- **Rushed release timing**
- **Inconsistent ball grip**
- **Poor follow-through**

These errors can drastically affect a player's shooting percentage and are often hard to detect without frame-by-frame video or sensor-based analysis — areas where AI excels.

Chapter 3

Artificial Intelligence Fundamentals for Sports Applications

3.1 Introduction to Artificial Intelligence

Artificial Intelligence (AI) refers to the simulation of human intelligence in machines programmed to think and learn. In sports, AI enables machines to perform tasks such as movement recognition, performance prediction, and pattern detection, which traditionally required human expertise. AI systems analyze vast amounts of data and produce actionable insights in a fraction of the time. There are multiple branches of AI relevant to sports:

Machine Learning (ML): The ability of machines to learn from data and improve over time without being explicitly programmed.

Computer Vision: Enables machines to understand and interpret visual information, such as player movements and object tracking.

Deep Learning: A subset of ML using neural networks with multiple layers that can learn complex patterns.

Natural Language Processing (NLP): Used in commentary automation, not directly involved in shooting analysis but relevant in post-game reporting.

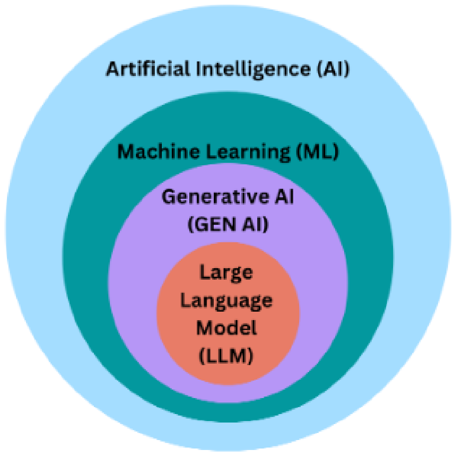

Figure 3.1: Multiple Relevant Branches of AI

3.1.1 AI in the Sports Ecosystem

Injury Prediction and Prevention AI helps predict and prevent sports injuries by analyzing biomechanical data, player workload, and joint stress. It uses data from wearables and video footage to identify movement patterns that lead to injury. Coaches can adjust training routines, preventing overexertion and improving athlete longevity through proactive, data-driven decisions.

Game Strategy Analysis AI examines historical data, team formations, and individual player tendencies to offer in-depth tactical insights. By analyzing video footage and statistical patterns, it predicts opponent strategies and suggests optimal plays. Coaches use this information to develop counter-strategies, improving decision-making and enhancing competitive advantage during critical game moments.

Player Performance Monitoring

AI uses sensors, video analysis, and GPS tracking to assess player fatigue, movement efficiency, and on-field positioning. It provides real-time feedback, enabling coaches to manage player load and enhance performance. This data-driven approach ensures athletes operate at peak levels while minimizing burnout and improving long-term physical conditioning.

Fan Engagement

AI boosts fan experience through virtual commentators, chatbots, and personalized content. Predictive polls and highlight generation increase interactivity.

Fans receive tailored updates and real-time insights, enhancing emotional connection with teams. These tools create a more immersive viewing experience, attracting wider audiences and boosting engagement across digital platforms.

In basketball, AI's most practical application lies in shooting analysis — a combination of motion tracking, pattern recognition, and biomechanical assessment.

3.1.2 Why AI in Basketball Shooting?

Biomechanical form

Consistent motion patterns

Timing and coordination

Psychological consistency

These variables are hard to monitor through visual inspection alone. AI solves this by:

Capturing micro-movements at high frame rates.

Analyzing trajectories with mathematical precision.

Comparing individual shooting forms with a trained "ideal" model.

Offering real-time, personalized corrective feedback.

3.1.3 The Role of Data in AI Systems

AI requires data to learn, adapt, and improve. The typical AI pipeline involves the following steps:

- **Data Collection** – Videos, sensor readings, motion logs.
- **Data Labeling** – Tagging successful vs. unsuccessful shots.
- **Feature Extraction** – Isolating elbow angle, release timing, etc.
- **Model Training** – Using labeled data to teach the model.
- **Model Evaluation** – Testing model accuracy using metrics.
- **Deployment** – Integrating AI in training apps, smart courts, etc.

Without structured and high-quality data, AI models may fail to generalize and produce meaningful results.

Chapter 4

Technologies Used in AI Basketball Shooting Analysis

4.0.1 4.1 Hardware Technologies

In AI-powered basketball shooting analysis, hardware forms the foundation for accurate data collection. These physical components are responsible for capturing real-time performance data that serve as inputs to AI models.

4.1.1 Cameras and Video Capture Systems

High-speed video capture is essential for analyzing the rapid and complex motion involved in basketball shooting. Cameras operating at frame rates above 120 FPS ensure that subtle biomechanical movements, such as wrist flick or elbow rotation, are not missed. Multi-angle camera systems enable 3D reconstruction of player posture and motion, providing a comprehensive spatial understanding of actions. This is particularly important in determining whether a player maintains proper shooting form or deviates due to fatigue or poor mechanics. Moreover, advancements in stereo vision and depth cameras have allowed the creation of virtual environments where athletes can be analyzed without intrusive sensors.

4.1.2 Motion Sensors and Wearables

Motion sensors enhance the granularity of physical data collection by directly measuring acceleration, rotation, and orientation. Accelerometers quantify move-

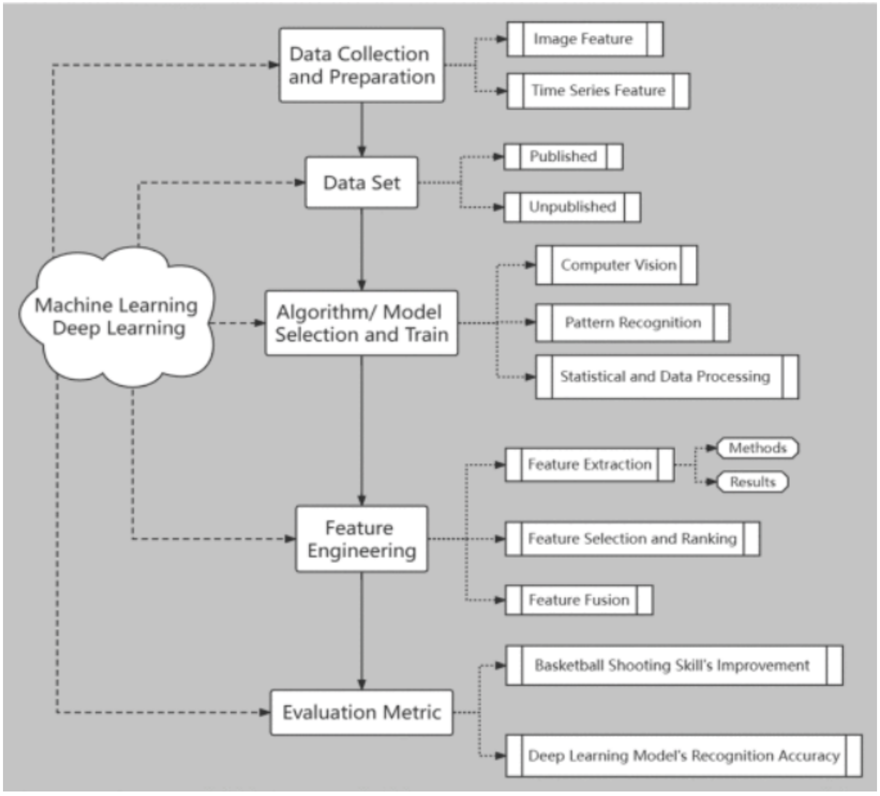

Figure 4.1: Flow chart of artificial intelligence methodology in the field of basketball shooting

ment intensity, while gyroscopes measure angular changes—useful for detecting wrist and elbow rotation during a jump shot. IMUs combine multiple sensor types to provide a complete view of body mechanics. These wearables offer real-time tracking without requiring visual contact, making them suitable for use during practice and gameplay. Technologies such as ShotTracker record when and where a shot is taken, while Noah's Arc System measures shot trajectory to determine optimal release angles. Together, these tools offer a holistic view of the player's performance.

4.0.2 4.2 Software Technologies

Software technologies interpret the raw data gathered by hardware. They apply computational intelligence to analyze, predict, and improve player performance.

4.2.1 Computer Vision Frameworks

Computer vision transforms video input into structured data through human pose detection and object tracking. Frameworks like OpenPose detect 2D key-points on the human body, enabling systems to identify posture irregularities or consistency across multiple shots. MediaPipe is optimized for lightweight applications and mobile integration, making it ideal for real-time feedback in portable training apps. YOLO's fast object detection allows tracking of dynamic elements like the ball, player, and hoop simultaneously, enabling contextual understanding of gameplay events such as contested shots or defensive pressure.

These tools allow AI to "see" the same way a coach does, but with more consistency and objectivity.

4.2.2 Machine Learning Algorithms

Machine Learning (ML) is essential for pattern recognition in shooting data. Algorithms like Support Vector Machines (SVMs) use historical labeled data to learn how to distinguish between successful and unsuccessful shots. These models can identify complex, non-linear relationships between form variables (e.g., elbow angle, release speed) and outcomes. K-Nearest Neighbors (KNN) relies on similarity measures, making it useful in comparing a current shot to previously successful attempts. Decision Trees and Random Forests provide interpretable models, allowing coaches to see which features (such as jump height or foot positioning) most influence shooting accuracy. This data-driven approach supports evidence-based training strategies.

4.2.3 Deep Learning Techniques

Deep learning enables the analysis of large, unstructured datasets like continuous video feeds. Convolutional Neural Networks (CNNs) are effective for extracting spatial features from image sequences, identifying key visual cues such as shooting arc and body alignment. These models can learn from thousands of annotated frames to develop a nuanced understanding of good shooting form. Recurrent Neural Networks (RNNs), particularly Long Short-Term Memory (LSTM) models, are designed to process time-series data. They excel at capturing movement dynamics across multiple frames, helping identify issues like inconsistent shot rhythm or delayed follow-through. Deep learning supports personalized, adaptive training tools that evolve with the athlete.

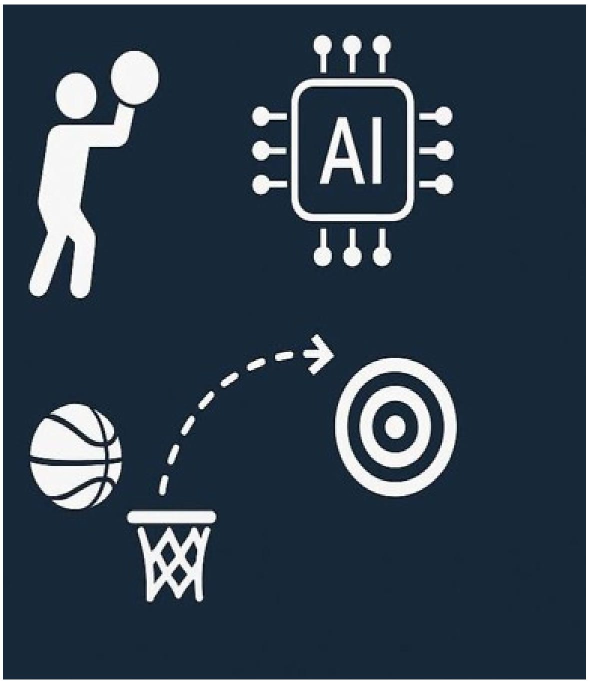

Figure 4.2: Vision of AI integration in basketball

4.0.3 4.3 Sample Workflow of AI in Shooting Analysis

A streamlined workflow integrates hardware and software components to provide end-to-end shooting analysis:

`[Camera Capture]` $\rightarrow$ `[Pose Detection with OpenPose]` $\rightarrow$ `[Feature Extraction]` $\rightarrow$ `[Machine Learning Model]` $\rightarrow$ `[Performance Scoring]` $\rightarrow$ `[Real-time Feedback]`

This process begins with video or sensor data capture. Pose estimation extracts body movement data, which is then used to calculate biomechanical features like shooting angle, speed, and release timing. A trained ML model classifies the shot quality, producing a performance score. Feedback is delivered instantly, allowing players to correct form without delay, reinforcing motor learning through real-time corrections.

4.0.4 4.4 Example: Smart Basketball System

The Noah Basketball system is a benchmark in smart sports technology. It uses an AI-powered camera mounted above the rim to track every shot. It captures key metrics like:

- **Shot Arc:** Determines if the release height and trajectory are optimal.
- **Shot Depth:** Measures how far the ball travels into the hoop.
- **Left-Right Deviation:** Tracks lateral error in the shot.

This feedback is transmitted to a connected app within seconds, enabling athletes to make adjustments on the next attempt. Such instant performance analytics empower athletes to self-correct and optimize their shooting mechanics rapidly.

4.0.5 4.5 Integration with Coaching Tools

AI-generated data is most valuable when integrated into tools that support coaching and athlete development. Mobile applications offer personalized shot histories and improvement trends. Web-based dashboards allow coaches to monitor team-wide statistics, detect patterns, and design data-informed training regimens. Augmented reality (AR) tools offer in-practice feedback by overlaying virtual guidance on the physical court. For example, players could see a virtual line indicating their optimal shooting arc. This real-time integration ensures that data becomes action—not just observation—creating a continuous improvement loop that enhances skill development and decision-making.

Chapter 5

Data Collection & Preprocessing

5.1 Introduction

Data collection and preprocessing are vital steps in any AI project, as they directly influence the performance of machine learning models. For basketball shooting analysis, accurate and well-structured data helps ensure that the AI system can make precise predictions about shot quality, player performance, and potential improvements. This chapter discusses the types of data collected, the preprocessing techniques used, and how this raw data is prepared for input into machine learning models.

5.2 Types of Data Collected

Data collection in AI basketball shooting analysis is multi-faceted and combines various data sources to form a holistic view of player performance.

5.2.1 Video Data

High-resolution video footage from cameras captures player movements, shot attempts, and ball trajectories. Multiple camera angles are typically used to track player actions in three dimensions. Video data is especially important for applications in computer vision, as it allows for pose detection, motion tracking, and object recognition.

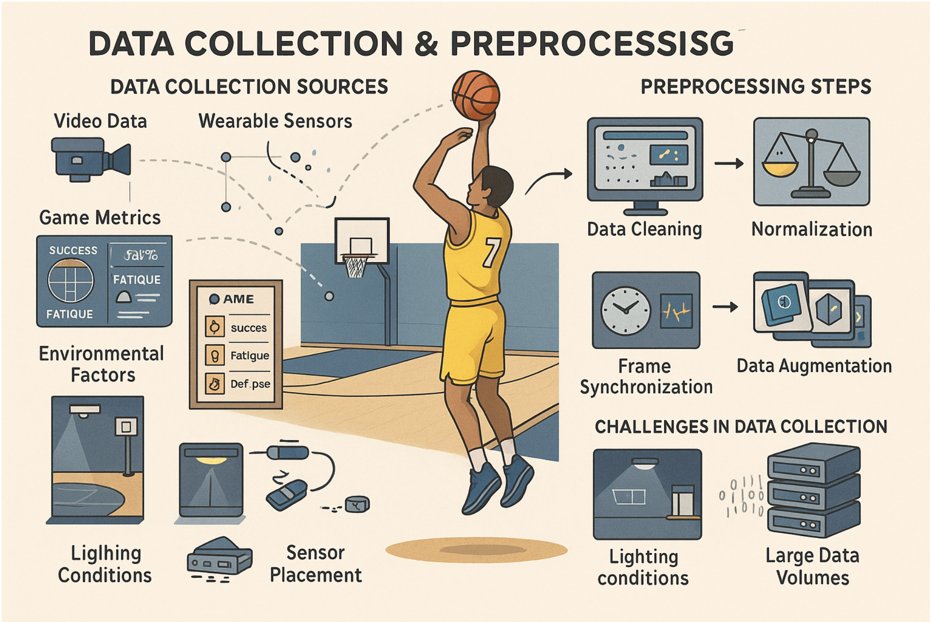

Figure 5.1: Overall Preprocessing

5.2.2 Sensor Data

Wearable sensors, such as accelerometers, gyroscopes, and IMUs, track real-time body movement during shot attempts. These sensors collect data on joint angles, acceleration, jump height, and posture. Sensor data enhances video data by providing real-time, precise measurements of physical movements, especially when players are out of view of the cameras.

5.2.3 Game Metrics and Player Data

In addition to video and sensor data, game-specific metrics such as shot location, shot success rate, player fatigue level, and defensive pressure are often recorded. This data is essential for developing personalized insights for each player, as different players have different playing styles and mechanics.

5.2.4 Environmental Data

Environmental factors such as court dimensions, hoop height, and ball type are also important. In controlled environments like training facilities, these parameters can be standardized. However, in live-game situations, these factors may vary, making it essential to account for them in the analysis.

5.3 Preprocessing Data

Once the data is collected, it needs to be preprocessed to remove noise, handle missing values, and prepare it for feature extraction and model training.

5.3.1 Data Cleaning

Raw video and sensor data may contain noise or inconsistencies, such as missing frames or sensor errors. Data cleaning involves identifying and correcting these anomalies to ensure that the data fed into machine learning models is accurate and reliable. Techniques like interpolation or smoothing are often used to fill in missing data points or to reduce noise in sensor readings.

5.3.2 Normalization and Standardization

To make the data comparable, it often needs to be normalized or standardized. For example, sensor readings such as acceleration or angular velocity might be on different scales, which can bias the model. Standardization transforms the data into a common range or scale, which improves the model's ability to learn from the data.

5.3.3 Frame Synchronization

In the case of video data, it's crucial to ensure that video frames are synchronized with sensor data to ensure accurate analysis. If the video frames and sensor data are not properly aligned, the AI model could misinterpret movements, leading to inaccurate predictions.

5.3.4 Data Augmentation

Data augmentation techniques such as rotating, flipping, or adding noise to video frames or sensor data can help increase the amount of training data. This is especially useful when dealing with limited data, ensuring that the model can generalize well to different shooting scenarios.

5.4 Challenges in Data Collection

Despite advancements in hardware, data collection for basketball shooting analysis still faces challenges such as:

- **Lighting Conditions:** Low-light environments can affect video quality, making it harder for computer vision models to detect player movements.
- **Sensor Placement:** Incorrectly placed sensors can yield inaccurate measurements, affecting the quality of biomechanical data.
- **Large Data Volumes:** The sheer amount of video and sensor data collected during training or games can be difficult to manage and process.

5.5 Conclusion

Data collection and preprocessing lay the groundwork for effective AI-driven basketball shooting analysis. By collecting accurate and diverse data, cleaning and preparing it properly, we can ensure that machine learning models are fed with high-quality information, leading to more precise and actionable insights for players and coaches.

Chapter 6

Feature Extraction & Model Training

6.1 Introduction

Once the data is cleaned and preprocessed, the next critical step in AI basketball shooting analysis is feature extraction. This process involves identifying and selecting key attributes from the raw data that will be used to train machine learning models. Feature extraction helps transform raw data into a form that is more meaningful and easier for algorithms to learn from.

6.2 Feature Extraction in Basketball Shooting Analysis

Feature extraction plays a key role in determining the success of AI models. In basketball shooting, important features are derived from both video and sensor data.

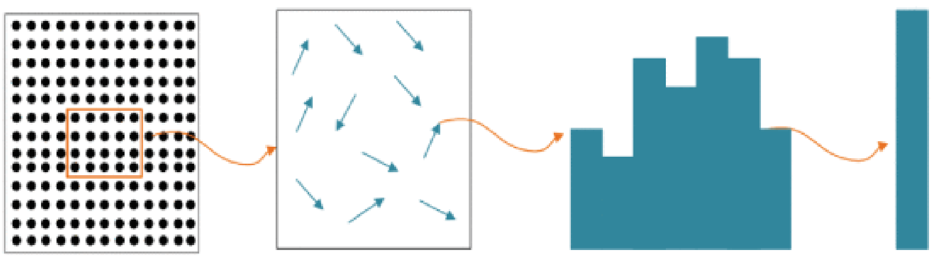

Figure 6.1: Schematic diagram of statistical feature extraction methods

6.2.1 Key Visual Features from Video Data

From the video data, several features can be extracted, including:

- **Shooting Angle:** The angle of the player's elbow or wrist during the shot.
- **Release Timing:** The point at which the player releases the ball relative to their jump or stance.
- **Shooting Arc:** The trajectory of the ball from the player's hands to the hoop.
- **Foot Positioning:** The placement and movement of the player's feet during the shot.

6.2.2 Key Motion Features from Sensor Data

From the sensor data, we can derive the following features:

- **Joint Acceleration:** Measures how quickly the player's joints move, particularly the wrists and elbows during the shot.
- **Jump Height:** The height reached by the player during the shot, which can influence shot success.
- **Angular Velocity:** Measures the speed of the player's arm rotation, particularly the wrist flick and follow-through.

6.2.3 Aggregating Features for Model Training

Combining both visual and sensor features can offer a comprehensive understanding of the shot mechanics. Aggregated features include combined metrics like:

- **Shot Consistency:** How consistent the player's form is across different attempts.
- **Form Deviation:** Variations in body posture or movement during different shots.

6.3 Model Training Process

Once the features are extracted, the next step is to train machine learning models. The following methods are typically used:

6.3.1 Supervised Learning

Supervised learning is the most common approach in basketball shooting analysis, where labeled data (successful vs. unsuccessful shots) is used to train a model. The goal is to learn a mapping from features (such as shooting angle, release timing) to the target label (shot outcome). Common algorithms include:

- **Support Vector Machines (SVM):** Useful for classification tasks, such as predicting whether a shot will be successful or not.
- **Random Forests:** Effective for handling a large number of features and identifying the most influential ones.
- **K-Nearest Neighbors (KNN):** Identifies patterns by comparing new shots to previously successful ones.

6.3.2 Unsupervised Learning

Unsupervised learning is useful when the goal is to find hidden patterns or groupings in the data. Techniques like clustering can group similar shots, identifying optimal shooting zones or styles.

6.3.3 Deep Learning for Complex Models

For more complex tasks, deep learning techniques such as Convolutional Neural Networks (CNNs) and Recurrent Neural Networks (RNNs) can be applied. CNNs are particularly useful for visual feature extraction, while RNNs, especially Long Short-Term Memory (LSTM) networks, are ideal for analyzing time-series data like shot sequences.

6.4 Model Evaluation

After training the models, they must be evaluated to ensure that they generalize well to new, unseen data. Common evaluation metrics for basketball shooting models include:

- **Accuracy:** The percentage of correct predictions.
- **Precision and Recall:** Useful when the goal is to minimize false positives or false negatives.
- **F1-Score:** A balance between precision and recall.

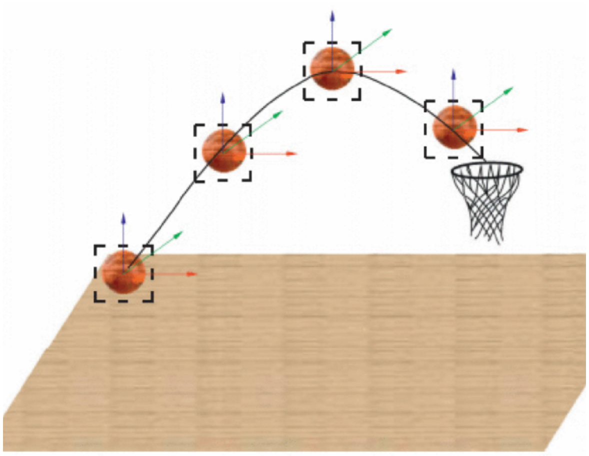

Figure 6.2: Ball Trajectory

- **ROC-AUC:** Measures how well the model distinguishes between shot success and failure.

6.5 Challenges in Model Training

Training effective AI models for basketball shooting analysis presents several challenges, including:

- **Overfitting:** Models may perform well on training data but fail to generalize to new data.
- **Data Imbalance:** The dataset may contain more successful shots than unsuccessful ones, causing the model to be biased.
- **Feature Selection:** Identifying the most relevant features from large datasets can be difficult.

6.6 Conclusion

Feature extraction and model training are critical steps that determine the effectiveness of AI in basketball shooting analysis. By carefully selecting and processing features, and choosing the right machine learning algorithms, AI can provide valuable insights into player performance and shot optimization.

Chapter 7

Common Merits and Demerits of AI Technologies in Basketball Shooting Research

In the research on basketball shooting, the applications of two artificial intelligence (AI) technologies—computer vision and machine learning/artificial neural networks—are not mutually exclusive but rather complementary, each with its focus. The following discusses their common merits and demerits.

7.1 Merits

7.1.1 Data-driven

Both computer vision technology and machine learning/artificial neural networks rely on extensive datasets for training and analysis. Data plays a crucial role in enhancing the accuracy, performance, and depth of quantitative research in basketball shooting models.

7.1.2 Real-time and Automated Analysis

Both approaches possess the capability to capture, extract, and evaluate sports data in real-time, reducing the need for manual intervention and improving the efficiency and precision of sports analysis.

7.1.3 Personalized Guidance

Both technologies can adapt models based on individualized data, offering tailored sports analysis and training programs that cater to the unique characteristics and requirements of individuals, thereby facilitating improved performance.

7.2 Demerits

7.2.1 High Data Requirements

Both computer vision and machine learning/artificial neural networks demand substantial amounts of data for training. This necessitates time and resource-intensive efforts in acquiring and annotating large-scale datasets. Moreover, the quality and diversity of the dataset significantly impact model performance.

7.2.2 Lengthy Training Time

Training complex models requires considerable time, involving multiple iterations and parameter adjustments to achieve higher accuracy and performance.

7.2.3 Sensitivity to Noise and Outlier Data

Both techniques are sensitive to data quality and accuracy. Noise, outliers, or erroneous labels in the dataset may adversely affect model training and performance, thus necessitating data cleansing and processing to enhance model robustness.

7.3 Summary

Leveraging computer vision and machine learning/artificial neural networks can provide data-driven approaches, real-time and automated analysis, and personalized guidance. These technologies facilitate accurate, efficient, and individualized training and guidance for basketball players. However, challenges such as data requirements, lengthy training time, and sensitivity to data quality must be addressed to maximize the potential of these technologies in advancing basketball shooting techniques.

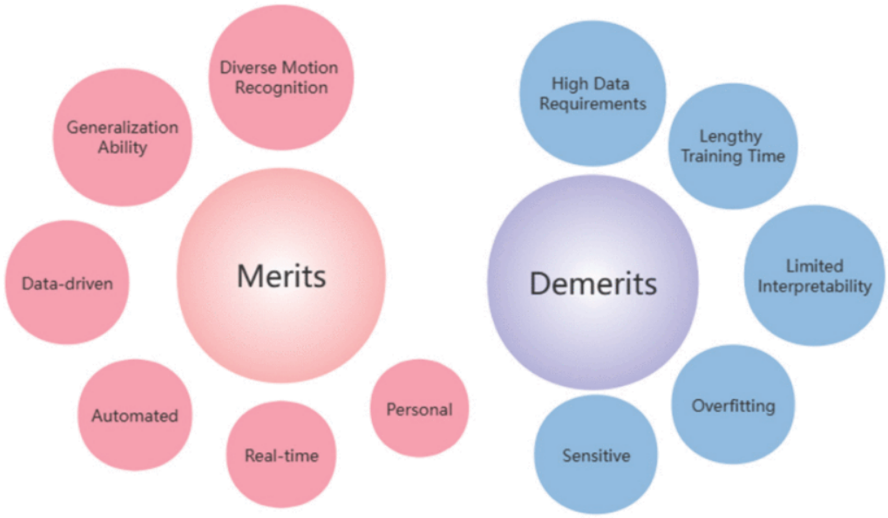

Figure 7.1: Merits and demerits of Computer Vision

7.4 Background, Objectives, Limitations, and Core Questions

7.4.1 Background

The technical aspects of basketball shooting involve various factors such as the player's posture, movement trajectory, and the trajectory of the ball. Traditional analysis methods have limitations in capturing and analyzing these factors comprehensively. The application of AI technologies provides a more detailed, accurate, and efficient method for analyzing and predicting basketball shooting performance.

7.4.2 Objective

The objective of applying AI technology in basketball shooting is to achieve intelligent correction and prediction of shooting motion and direction. By analyzing data such as the player's posture, ball trajectory, and velocity, personalized guidance and training suggestions can be provided to improve shooting accuracy and consistency.

7.4.3 Limitations

Data Collection

Accurate analysis and prediction require a large amount of basketball shooting data, including videos, images, and sensor data. The quality and accuracy of the collected data are crucial for the reliability of the research results.

Data Processing and Analysis

Processing and analyzing basketball shooting data require complex techniques, such as computer vision, machine learning, and statistical analysis. Selecting suitable algorithms and optimizing models require specialized technical knowledge and skills.

Real-time Application and Practicality

Evaluating and correcting shooting performance in real-time during basketball games and training sessions presents a significant challenge. Developing efficient and practical real-time AI systems is crucial for practical deployment.

7.4.4 Core Questions

Based on the background, objectives, and limitations, the core questions in applying AI technology to basketball shooting research include:

- How to accurately capture relevant data in basketball shooting, such as the player's posture, ball trajectory, and velocity, through a combination of computer vision and sensor technologies?
- How to analyze and model basketball shooting data using machine learning and statistical analysis methods to evaluate and predict shooting accuracy?
- How to design an intelligent correction system that utilizes AI to provide real-time guidance and feedback to athletes, helping them improve their shooting posture and overall performance?

Addressing these questions can lead to the establishment of an intelligent analysis and correction system for basketball shooting, which holds immense significance for professional sports, physical education, and recreational sports.

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