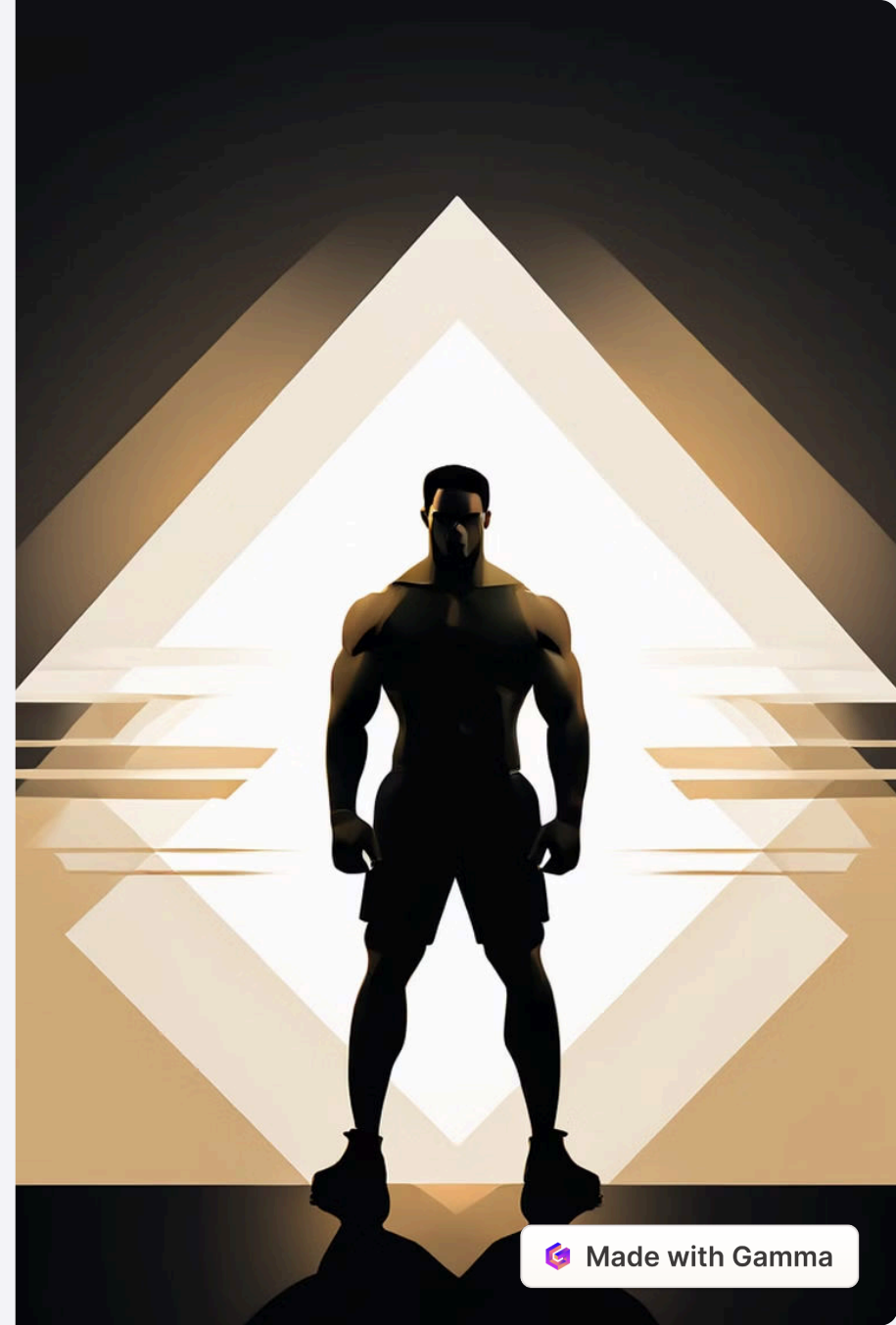


# AI in Sports Performance Analysis: Detecting Enhancement

This presentation delves into the exciting realm of artificial intelligence (AI) and its potential to analyze sports performance, particularly in the context of identifying athletes who might be using performance-enhancing substances.

 by Demys Cota



# Defining Natural and Unnatural Performance

## Natural Performance

Natural performance refers to the athletic abilities achieved through consistent training, proper nutrition, and genetics. Athletes relying on natural means may experience slower progress but build sustainable, long-term gains.

## Unnatural Performance

Unnatural performance involves the use of performance-enhancing substances, which can artificially enhance physical abilities, leading to rapid gains but posing serious health risks and violating ethical principles.



# Data Collection Methods

## 1 Wearable Sensors

Wearable sensors track physiological data like heart rate, oxygen levels, and movement patterns, providing a continuous stream of information.

## 2 Motion Capture

Motion capture systems use cameras and specialized markers to analyze an athlete's movements, providing detailed insights into their biomechanics.

## 3 Biomechanical Analysis

Biomechanical analysis involves studying the forces and movements involved in athletic activities to understand efficiency and potential areas for improvement.

## 4 Blood and Urine Tests

Traditional blood and urine tests are used to detect the presence of specific substances prohibited by sports organizations.

# Machine Learning Algorithms

## Decision Trees

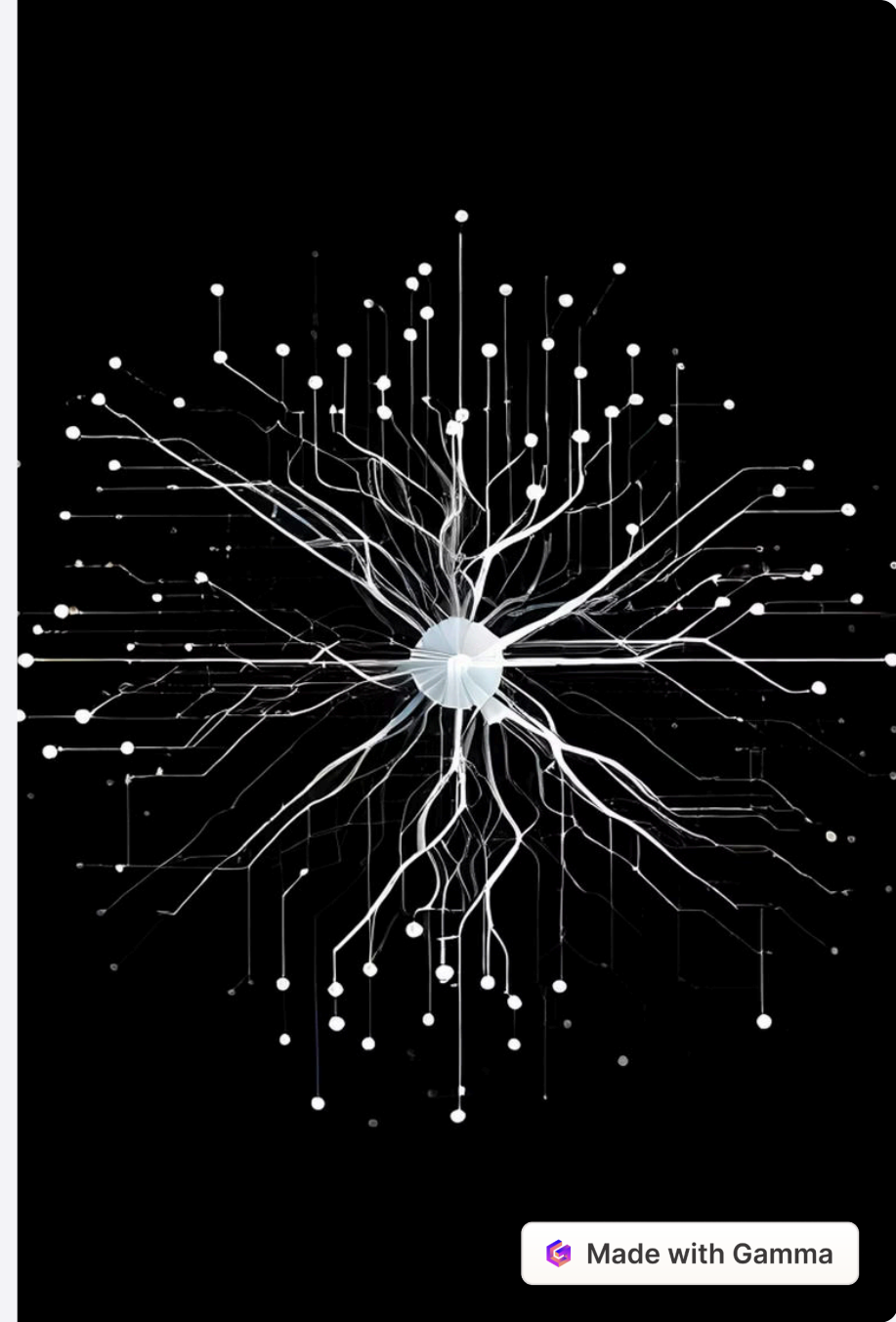
Decision trees classify data based on a series of rules, providing a transparent and interpretable model.

## Support Vector Machines

Support vector machines identify optimal boundaries between classes by maximizing the margin between data points, offering high accuracy.

## Neural Networks

Neural networks, inspired by the human brain, can process complex data patterns and learn from vast amounts of information, achieving superior performance.



# Feature Engineering and Model Training

1

## Feature Selection

Selecting relevant features from the collected data is crucial for model performance, focusing on variables directly related to performance enhancement.

2

## Feature Transformation

Transforming raw data into meaningful features, such as calculating ratios and applying mathematical functions, enhances model accuracy.

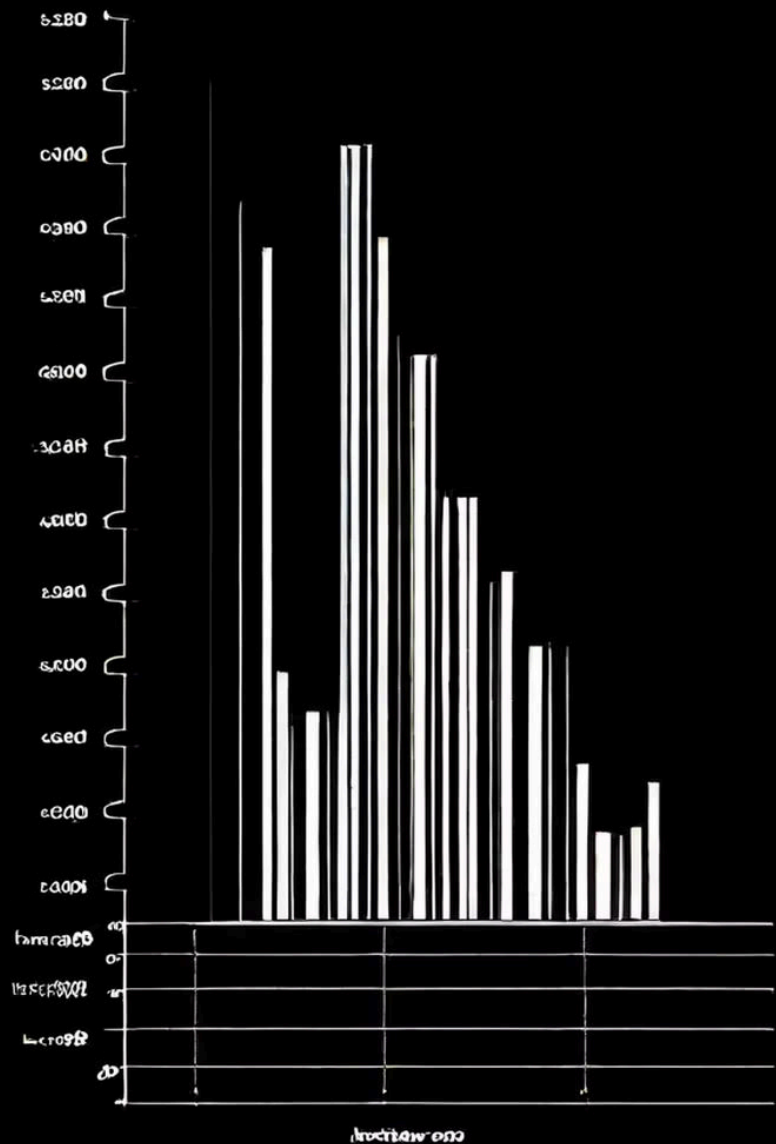
3

## Model Training

Feeding the engineered features into the chosen algorithm, the model learns to differentiate between natural and unnatural performance.







# Evaluating Model Accuracy and Reliability

Metric	Description
Accuracy	Percentage of correctly classified athletes.
Precision	Percentage of correctly identified athletes who are actually enhanced.
Recall	Percentage of enhanced athletes correctly identified by the model.
F1-Score	A balanced measure of precision and recall.

# Ethical Considerations

1

## Data Privacy

Protecting sensitive athlete data is crucial, ensuring responsible collection, storage, and use, adhering to privacy regulations.

2

## Transparency and Explainability

Ensuring transparency in the AI model's decision-making process is essential for building trust and understanding its conclusions.

3

## Fairness and Bias

Addressing potential biases in data and algorithms is crucial to prevent unfair or discriminatory outcomes for athletes.





# Conclusion and Future Applications

AI offers a powerful tool for sports performance analysis, enabling more accurate detection of performance enhancement. Future applications extend beyond athlete assessment, including personalized training plans, injury prevention, and enhanced fan engagement.