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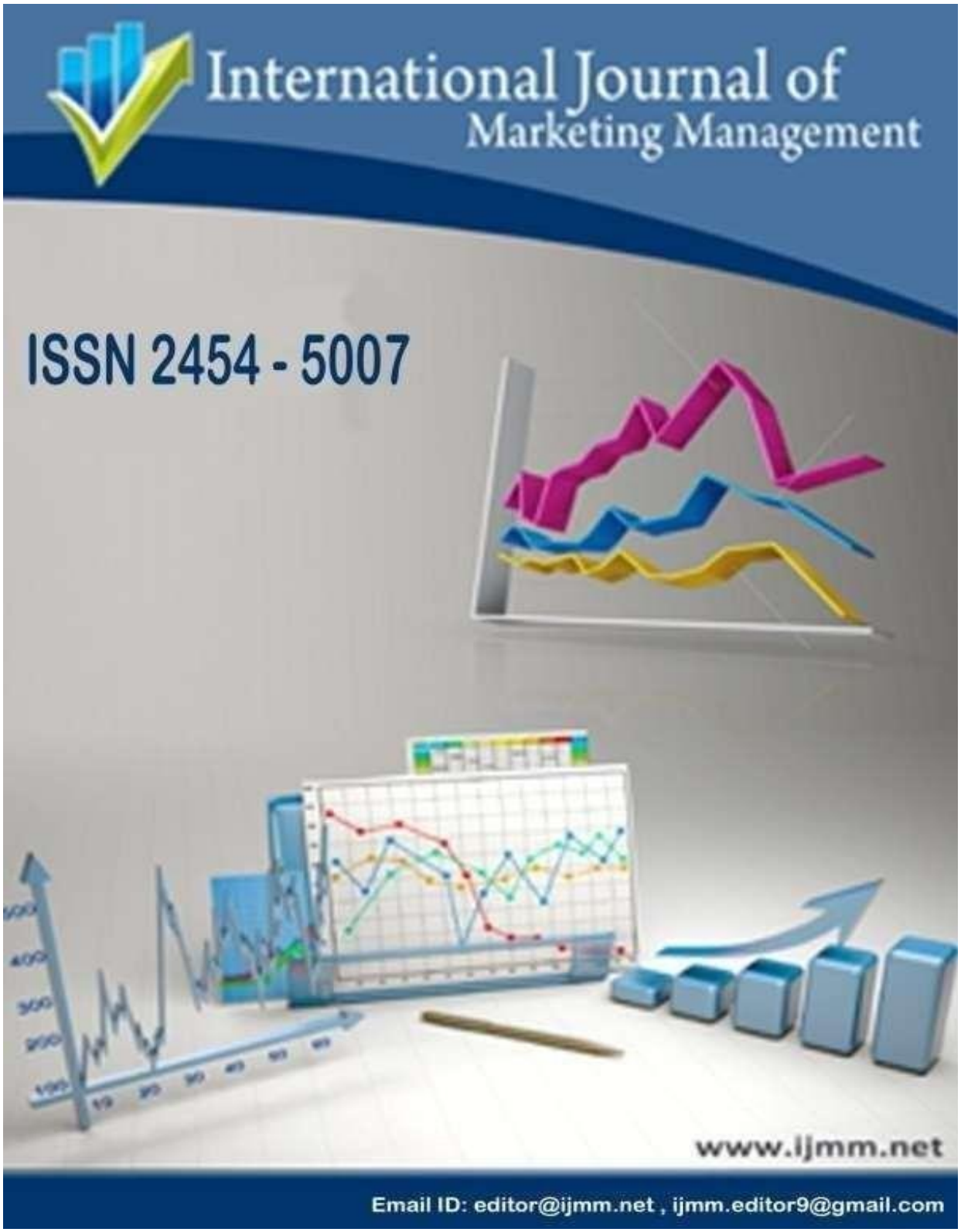

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AI in Sports Analytics for Player Performance

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ABSTRACT

The incorporation of Artificial Intelligence (AI) into sports analytics is revolutionizing how teams evaluate player performance and mitigate injuries. Traditional methods for evaluating and calculating the performance is less accurate whereas AI-powered models utilize machine learning algorithms to deliver data-driven insights with enhanced precision, greater accuracy and efficiency. Machine Learning Techniques such as Random Forest for forecasting performance and K-Means clustering for segmenting players. A Long Short-Term Memory performance and injury risks based on historical match data.

KEY WORDS

Artificial Intelligence, Random Forest, K-Means clustering, Machine Learning, Long Short-Term Memory.

INTRODUCTION

Data-driven decision-making is essential to improving team tactics and player performance in the modern sports sector. Sports analytics' incorporation of artificial intelligence (AI) is revolutionizing how players prepare and compete. Real-time performance insights are made possible by wearable data, video feeds, and match statistics. Large, complicated datasets are mined for patterns and trends using AI and machine learning (ML). The main goal of this project is to monitor important player attributes like location, accuracy, speed, and stamina. OpenCV, scikit-learn, TensorFlow, and Python are among the technologies used for data analysis. Conventional techniques depend on human observation, which frequently results in inconsistent feedback. Our objective is to develop an AI-powered solution that makes performance analysis automated. AI analyzes movement patterns and physical stress to aid in the early diagnosis of injuries. Athletes can maximize their training regimens by turning raw data into insights. Coaches have access to performance reviews and strategies supported by data. The project improves competitive sports performance on both an individual and team level. In conclusion, artificial intelligence (AI) in sports analytics improves performance evaluation by adding intelligence, speed, and precision.

LITERATURE REVIEW

I looked through a lot of papers and selected these three papers and identified drawbacks. The first study, Using GPS Data and Machine Learning to Predict the Soccer Players' Position, was written by H.A. Jafari and published in 2020.This paper's primary drawback is the limitations and inaccuracy of GPS data. The second study, A Framework for Real-time Player Performance Analysis in Basketball using Computer Vision, was written by M.V.K.A. Varma and published in 2021. The primary drawback is that quick movements and occlusions are difficult for computer vision to handle. The third paper, Predicting Injury Risk in Elite Athletes Using Wearable Technology and Machine Learning, was

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written by S.M.P.G. Perera and published in 2022.The primary drawback is the low generalizability of the injury risk prediction models. These drawbacks are solved by proposed system.

RELATED WORK

Python is the main language of the project used for Data preprocessing (cleaning GPS, video, or sensor data), Model development (using ML/DL libraries like scikit-learn and TensorFlow), Visualization (with libraries like Matplotlib, Seaborn), Building custom scripts to automate analysis, generate reports, or run simulations. In this project, Python serves as the core programming environment, scikit-learn powers traditional machine learning tasks like prediction and clustering, TensorFlow enables deep learning for time-series and performance modeling, and OpenCV provides computer vision tools to extract insights from video footage, making the analysis both comprehensive and data-driven.

EXISTING METHOD

I saw a lot of restrictions in papers such as the model's limited generalizability, which may only work well on the particular athlete group it was trained on, is one of its main drawbacks. Prediction accuracy is heavily reliant on the completeness and quality of wearable sensor data, which might be noisy or inconsistent. Furthermore, the model can ignore crucial contextual elements that also raise the risk of injury, like stress, mental exhaustion, and sleep quality. Complex machine learning algorithms may make predictions less interpretable, making it harder for coaches and medical personnel to comprehend or believe them. Data processing and ongoing surveillance raise serious privacy issues as well. Lastly, processing delays, possible overfitting, and wearable technology integration problems can make it difficult to use these models in real-time.

PROPOSED METHOD

The suggested system builds a thorough, data-driven framework for player performance analytics using artificial intelligence (AI) and machine learning (ML). This approach, in contrast to current methods, is intended to give players, coaches, and management objective, real-time, and predictive insights. AI-powered insights derived from player data, both past and present. combining data from wearable sensors with video analysis. Machine learning models for analyzing injury risk and predicting performance. Player-specific indicators are used to provide tailored training recommendations. Dashboards that are easy to use for players, coaches, and analysts.

SYSTEM ARCHITECTURE

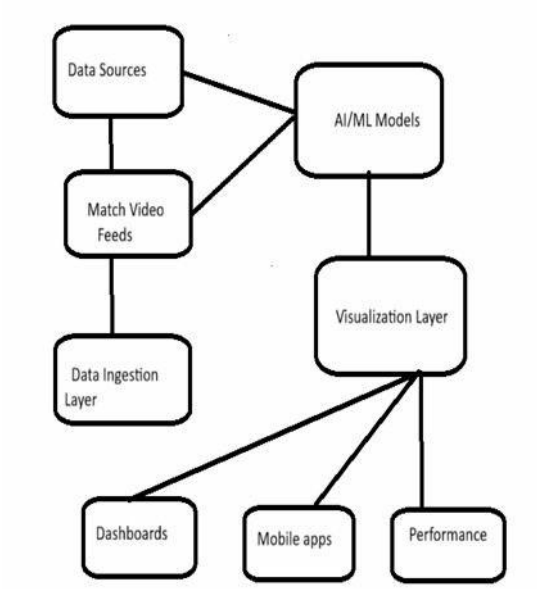

Figure 1: architecture of methodology

METHODOLOGY DESCRIPTION:

This project focuses on analyzing individual player performance using advanced data analytics techniques. The steps involved are:

Data Collection: Data is collected from multiple sources such as sports APIs, match logs, and sensor devices. Datasets maybe different types like goals, assists, distance covered.

Data Preprocessing: Cleaning missing or inconsistent entries, normalizing values (e.g., per 90 minutes), Encoding categorical data like player position or team, Organizing data season-wise or match-wise.

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Performance Metrics: Custom metrics are developed to evaluate player performance,
including Pass accuracy, Expected Goals and Assists, Player Impact Score, Defensive and offensive contributions.

Exploratory Data Analysis: Descriptive and comparative analytics are applied to: Identify performance trends, compare players by position or role, Understand match-by-match variation.

Visualization: Using tools like Python or Power BI, visualizations are created: Line graphs showing performance trends, Radar charts comparing skills, Heatmaps of player positions, Dashboards for quick performance summaries.

RESULTS AND DISCUSSIONS

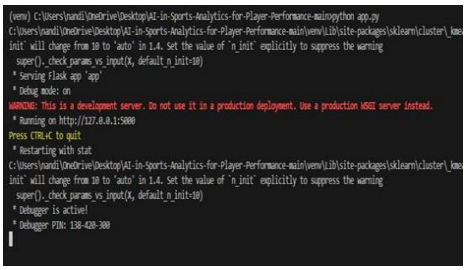

Figure 2 : execution process

Run the code in Command Prompt by using following command: python app.py then Open the application by clicking on the link http://127.0.0.1:5000.

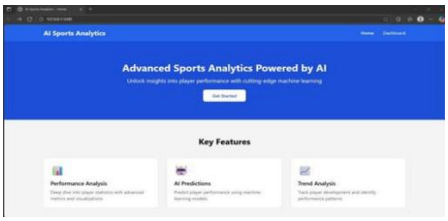

Figure 3 : Application page

When the link is clicked, this is the application page that appears.

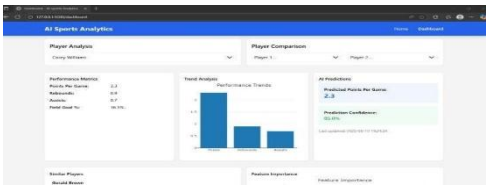

Figure 4: player analysis page This is the individual player analysis page where each player data can be visualized in bar graphs and can predict confidence.

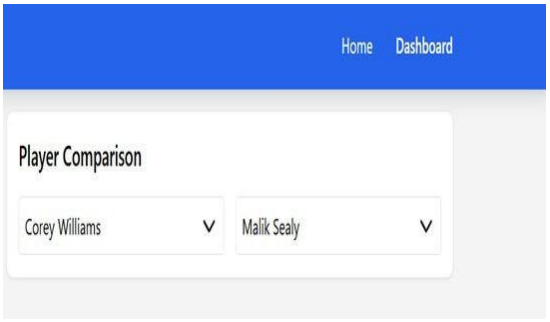

Figure 5 : Player comparison

By providing the names of the two players, it is possible to compare them in this case.

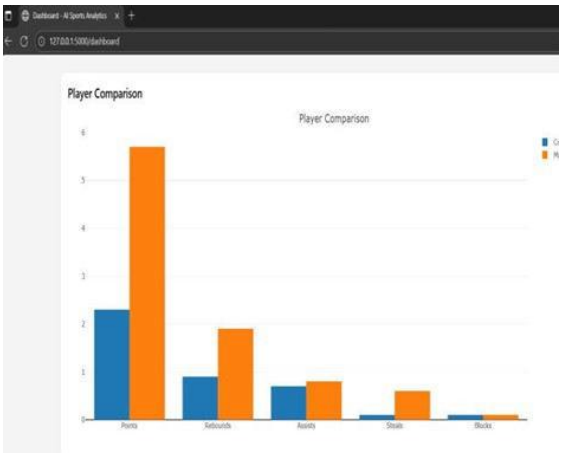

Figure 6: two players comparison

Based on the above statistics, this page compares the two players.

CONCLUSION

This project successfully demonstrates how data analytics can be used to assess and improve player performance in sports. By analyzing match statistics, physical metrics, and performance trends, the system provides valuable insights for coaches and players. Visual dashboards and custom KPIs enhance decision-making and player development.

FUTURE SCOPE

In the future, real-time data integration from wearables and live matches can enhance accuracy. Video analytics using computer vision could provide deeper tactical insights. Incorporating AI for

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automated performance feedback would make the system more intelligent.

REFERENCES

1. Harini, D. P. (2020/1). automated research for analysing and visualising the data used machine learning analytics. Dogo Rangsang Research Journal, 2347-7180.
2. Terner, Z. & Franks, A. "Modeling Player and Team Performance in Basketball." *Annual Review of Statistics and Its Application*, vol. 8, 2021, pp. 1-23.
3. Pappalardo, L., Cintia, P., Ferragina, P., Massucco, E., Pedreschi, D., Giannotti, F. "PlayeRank: data-driven performance evaluation and player ranking in soccer via a machine learning approach." arXiv preprint, 2018.
4. Brown, S. "A PageRank Model for Player Performance Assessment in Basketball, Soccer and Hockey." arXiv preprint, 2017.
5. Aydemir, A. E. "A Data Driven Performance Evaluation Framework for Sports Analytics." PhD thesis, 2021.
6. Zhao, K., Osogami, T., Morimura, T. "Visual analytics for team-based invasion sports with significant events and Markov reward process." arXiv preprint, 2019.
7. Singh, N. "Sport Analytics: A Review." *International Technology Management Review*, vol. 9, 2020, pp. 64-69.
8. Hou, S., Lan, X., Zhang, H., Luo, X. "Competitive Sports Research Based on Data Analytics and Machine Learning Models." *Academic Journal of Science and Technology*, 2024 (online).
9. De Silva, V., Caine, M., Skinner, J., Dogan, S., Kondoz, A., Peter, T., Axtell, E., Birnie, M., Smith, B. "Player Tracking Data Analytics as a Tool for Physical Performance Management in Football: A Case Study from Chelsea Football Club Academy." *Sports*, vol. 6 no. 4, 2018, article 130.
10. Methodology and Evaluation in Sports Analytics: Challenges, Approaches, and Lessons Learned. *Machine Learning*, 2024, vol. 113, pp. 6977-7010.
11. Narayanan, S. & Pifer, N. D. "A data-driven framing of player and team performance in U.S. Women's soccer." *Frontiers in Sports and Active Living*, vol. 5, 2023, article 1125528.
12. Pietraszewski, P., Terbalyan, A., Roczniok, R., Maszczyk, A., Ornowski, K., Manilewska, D., Kuliś, S., Zając, A., Gołaś, A. "The Role of Artificial Intelligence in Sports Analytics: A Systematic Review and Meta-Analysis of Performance Trends." *Applied Sciences*, vol. 15, no. 13, 2025, article 7254.
13. "Big Data in Sports: Predictive Models for Basketball Player's Performance." Lee, D.-J. and Page, G. L. Working Paper, Cambridge Open Engage, 2021.
14. "Modern Sports Analytics using Big Data." Khan, R. A., Sharma, Y. K., Gurav, M., Jadhav, P. *International Journal of Multidisciplinary Global Research*, Vol. 2 ISSUE 2, 2025.
15. "Performance Analysis of a Cricketer by Data Visualization." Harshitha G., Sreehari G., Mahesh Kumar S., Chinmai L., Dr. Geetha D. "IJRASET", 2022.
16. Jain, S. "AI in Sports: Deep Learning Models for Player Performance Analysis and Injury Prediction." *International Journal of Research & Technology*, Vol. 13 No. 1 (2025), pp. 11-17.
17. "Data science in sports analytics: A review of performance optimization and fan engagement." *World Journal of Advanced Research and Reviews*, 2024, Vol. 21(01), pp. 2663-2670.
18. "Short Survey in Machine Learning for Soccer Analytics." Amadu, P. Preprint (2024).