AI and Deep learning in Sports for Revolutionizing Performance and Strategic Planning

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Abstract:

The sports industry is experiencing a profound evolution, driven by cutting-edge technologies that are reshaping how athletes train, compete, and strategize. These innovations are transforming performance analysis, game strategy, and fan engagement, ushering in a new era of sports science and management. Artificial Intelligence (AI) and deep learning are revolutionizing sports by significantly enhancing both performance and strategic planning. Initially the data were collected from Collective Sports [Sensor] DB of Practice Sessions. This data is then meticulously cleaned and pre-processed to ensure accuracy and consistency, involving Z- score normalization. For feature selection using the Random Forest and Genetic Algorithm (RF-GA) and that features were extracted using the Kernel Principle Component Analysis (KPCA) and finally the models using the Novel Convolutional Long Short-Term Memory with Improved Quantum Particle Swarm Optimization (Conv-LSTM-IQPSO), are trained. These models are designed to recognize complex patterns and correlations that might be overlooked by human analysts. With these trained models, performance analysis is conducted to uncover insights into players' strengths and weaknesses, leading to tailored training programs and strategic recommendations. The AI-driven analysis extends to strategic planning, where simulations and predictive analytics play a crucial role. Coaches and managers can leverage these tools to anticipate opponent tactics, optimize game strategies, and make data-informed decisions during matches. This iterative process of incorporating new data and feedback ensures continuous improvement, keeping strategies relevant and effective. In summary, the integration of AI and deep learning in sports provides a sophisticated approach to enhancing performance and devising strategies, marking a transformative advancement in the field.

Keywords:

Artificial Intelligence, Deep learning, sports, Novel Convolutional Long Short-Term Memory with Improved Quantum Particle Swarm Optimization (Conv-LSTM-IQPSO), Kernel Principle Component Analysis (K-PCA).