

Thesis Project Portfolio

Smart Coaching with AI: Designing an Ethical AI Model for Real-Time Sports Analytics

(Technical Report)

Leveraging the Role of AI in Sports: Advancing Strategies and Mitigating Ethical Risks

(STS Research Paper)

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As artificial intelligence (AI) models and systems become increasingly integrated into day-to-day activities and decision-making processes, their use in high-stakes fields like professional sports analytics demands advanced technological innovation and ethical security. Addressing concerns from coaches, such as the rising number of CTE injuries and smarter ways to manage player performance, is critical to ensure that AI systems are being used to better the sports environment. From monitoring player performance, preventing injuries, and outputting performance analytics, AI systems have the ability to transform how sports organizations manage the performance of their players and optimize game strategies. In a world where AI is becoming integrated into data analytics, AI systems (like sensors and tracking devices) can capture real-time data on each player for every play. With this real-time data, AI can be used to assist coaches make smarter decisions, especially in high-stakes environments. However, ethical concerns exist with the current AI models that limit functionality and jeopardize player privacy of sensitive health data.

This technical capstone project addresses these ethical concerns to propose a new model that is unbiased and provides accurate outputs for coaches to make smarter game decisions. The capstone project discusses several key components to effectively provide data-driven insights to ensure player health is prioritized – such as making sure the model has a high execution speed, incorporating performance metrics into the model to output predictive statistics, integrating real-time and prior game data, and incorporating an ethical framework to address privacy and security concerns. The foundation for this model is also grounded in past findings from other AI systems and analysis from researchers. Designed to enhance game strategy, prevent injuries, and optimize player performance, this model can benefit teams across various sports organizations, with a goal

of providing equal access to each team. When developing an AI model, it is vital to protect the data being collected and stored with robust security measures. With this proposed model, problems like limitations on current models and existing ethical concerns will be addressed. When the model is successfully constructed, it can yield key results that coaches can utilize to make more informed decisions.

The STS research paper discusses specific case studies of how sports organizations currently use AI within the National Football League (NFL) and the National Basketball Association (NBA), and the privacy and ethical concerns that arise from its use. This paper investigates how AI can be utilized ethically and responsibly to create a fairer and safer environment in sports. A background on sports analytics is discussed to set the scene of how sports analytics has progressed over the years. The field has grown from old fashioned pencil and paper to track paper statistics to advanced technology that can perform more computationally heavy calculations. Findings from the case studies in the NFL and NBA are first discussed to highlight the positive use cases of AI. Currently, AI is being used to develop training programs for athletes, scout new talent for the coaching staff to recruit, identify formations that are successful to incorporate into game plays, and reduce the time spent manually reviewing game film and data. Analysis of how coaches and players feel about the use of AI in sports is also included in the findings section to support the claim of how AI is beneficial to player development and team success. An ethical argument is also formed that states the ethical concerns of the existing models. With each ethical concern discussed, a solution is proposed to help address issues like biased models, oversharing sensitive data to other teams in the league, and third parties accessing player data. Sports organizations use AI to reduce player injuries, monitor player performance, and enhance game strategies, but they also raise questions around

surveillance, fairness, and the potential for overreliance on data-driven decision-making.

Applying the Actor-Network Theory, this paper explores how AI is not just a technological artifact that operates independently, but rather part of a larger network of actors – including coaches, players, algorithms, and league officials. The broader social consequences of AI in sports, seen through the ethical concerns of data surveillance and how AI models might impact player privacy, are also considered.

Both this technical capstone report and research paper offer a holistic view of AI's role in sports analytics, highlighting that successful innovation must not only factor predictive accuracy and performance into account, but also social and ethical responsibility. By analyzing both the development of an ethical AI model and its deployment within a sociotechnical network, this project emphasizes the importance of designing AI systems that are effective, inclusive, fair, and secure.