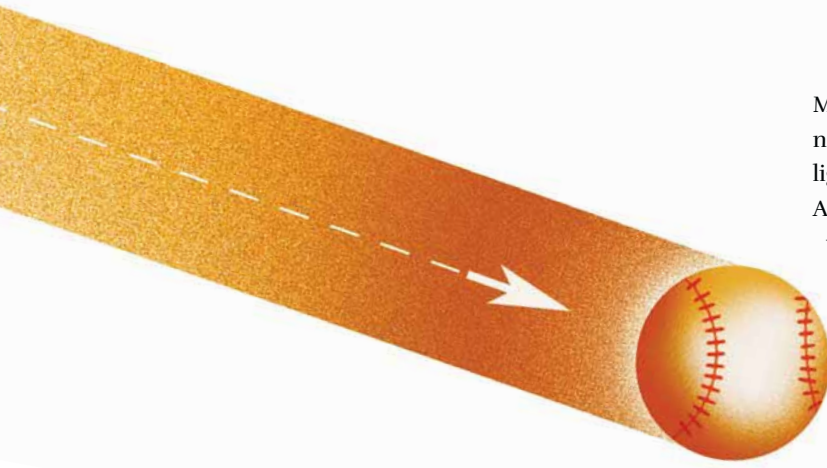# Lessons from sports to compete with AI

By Pedro Larrañaga and Concha Bielza

Sports teams are increasingly leveraging the power of artificial intelligence to enhance their performance. Here are five things companies can learn from them to achieve winning results.

More and more companies are realizing they, too, need to embrace AI to stay in the game, as highlighted in a recent study by IESE professors José Azar, Mireia Giné and Sampsa Samila, together with Liudmila Alekseeva and Bledi Taska. Examining U.S. online job postings between 2010 and 2019, the authors found that, while the demand for other computer-related skills remained stable, the demand for AI skills in particular was exploding – by a factor of 10 in absolute numbers and by a factor of four as a proportion of total job postings.

And this growing demand wasn't limited to the IT industry but was found across all sectors and occupation groups, including professional and administrative services, finance, manufacturing and even agriculture. What's more, such jobs commanded a wage premium – 11% on average, going up to an almost 18% higher salary for jobs in administrative and support service sectors. The significantly higher premium for AI skills suggests there is a "real shortage of managers who are able to create and capture value with AI," state the authors.

Having studied artificial intelligence for more than 30 years, we recognize the need for all professional entities to grow in their use of AI. We have spent our careers researching the many different ways that data can be used to analyze, predict and provide knowledge to optimize decision-making processes and enhance performance. This has led us to partner with Olocip, a firm set up by the Spanish professional soccer player Esteban Granero. We lead an AI modeling and development team for Olocip, offering business and sports clients customized solutions to their performance issues. Here, we share some of the practical applications derived from our professional work and research in this sphere.

W hen Billy Beane took over as manager of the U.S. baseball team, the Oakland A's, it was a lower valued team. The challenge he faced will be familiar to many businesses (and professional baseball is, after all, just another type of business): How to compete in the big leagues with fewer resources? He couldn't afford to recruit the best players. Instead, he turned to sabermetrics, using statistical analyses to crunch data on player metrics to see which ones bettered the odds of success. Determining that the percentage of players' On-base Plus Slugging (OPS) was a better metric than batting average, he recruited undervalued players with high OPS rather than more expensive players with high batting averages. Subsequently, the Oakland A's rose in the ranks, going on to win a record 20 consecutive games in the 2002 season. Their winning streak – and the transformative impact of analytics on the sport – became the subject of a book that was later made into the 2011 movie *Moneyball*.

Machine learning in sports

Statistical analyses of sports data began as far back as the 1950s, using manual annotation methods. Back then, the term artificial intelligence (AI) was just being coined, and the ability of machines to mimic sophisticated human tasks – like face recognition or making accurate medical diagnoses – was still decades away. It wasn't until recent years that AI evolved to the point of machine learning, not just being able to do complex statistical computations at lightning speed, but identifying patterns in the data, transforming those patterns into models, adapting those models according to incoming changes in the data, performing "reasoning" to generate new knowledge, and then aiding humans in arriving at decisions. This is where AI has become highly valued, especially as it removes aspects of human fallibility, which is where past analyses fell short.

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In sports, the two most relevant types of data to be collected are: 1) trajectories, the movement of the players or the ball within the field of play; and 2) events, which can include player actions such as passes or shots, or referee decisions like fouls and cards. But it's more than just collecting and storing the data with the aim of visualizing it, using descriptive methods to depict what has happened in the past, which is often as far as some analyses go. Current machine-learning algorithms enable us to go much further and deeper to: 1) the causal dimension, diagnosing why this has happened; 2) the predictive dimension, predicting what will happen next; and 3) the prescriptive dimension, suggesting what you can do to make what you want to happen next.

Practical applications

When the English soccer club, Leicester City, beat the odds and won the 2015-16 Premier League for the first time in its history, part of the credit was given to the club's savvy use of AI analytics and tools, including the use of wearables to track player movements. Using data-driven insights, training sessions were adapted to the needs of each player, and they honed their play to minimize injuries. Extrapolating from this and other well-known examples, we discuss five main areas where we find AI can contribute to competitive advantage:

SELECTION OF TALENT AND TEAM FIT. When scouting high-potential talent, sports clubs, like companies, are not just interested in analyzing individuals in isolation, comparing one profile with another and judging each relative to their respective past performances. What they really want to know is how that talent might perform within a given team configuration, and how their level of play might develop and improve over time.

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Predictive AI systems can do this, taking key performance metrics (e.g., assists, shots, goals, ball recoveries, loss of possession, etc.) and, using regression analysis, detecting the key variables and the relationships between them. Finding such correlations can help managers estimate how a certain player might perform as part of, not just the present team, but a future one with a different mix of variables. Crucially, the subjective, biased assessments of talent scouts are removed from the equation. These performance predictions can be complemented with estimates of a player's future market value, helping managers make more informed decisions about player transfers, contracts and insurance against possible losses in player value. AI can also suggest the position best suited to the performance metrics of a particular player, and predict a player's success based on factors such as creativity, inhibition or cognitive flexibility. Knowing all this can really help a coach, or business manager, configure their best team.

PREVENTION OF LOSSES. Player injuries cost English Premier League clubs a record £221 million, according to the Football Injury Index 2019 produced by the insurer Marsh JLT Specialty. AI can help reduce these costs by analyzing everything from training workload and training surfaces to lifestyle habits and even genes. The important thing here is not to produce false positives for certain risk factors. This underscores the need for feeding in reliable, trustworthy data. You need to check the AI is not overestimating risk, reducing the workload without the player actually being at risk, nor underestimating the probability of injury. Some AI systems can quickly and reliably predict recovery time after injury. And the data-driven advice can be tailored to the individual and be more precise, to avoid generic prescriptions like "players should generally avoid play for between 16 and 24 weeks for this category of injury." There are lots of applications here for any employer, where productivity losses linked to absenteeism have been estimated to be just as costly for business as for sport.

PREDICTION OF RESULTS. Systems abound to predict which team will win a match. Here, the choice of variables makes all the difference. In basketball, the speed of the game might be the relevant factor, whereas in soccer, ball possession or team fatigue based on the number of games played in the preceding weeks might be what counts. Which are the key variables to predict success for the results you want to achieve?

REAL-TIME SOLUTIONS. AI is also able to analyze how certain interventions during play, such as telling players to close gaps or play more aggressively, might change the probabilities of other variables, like scoring a goal. Think of using AI as a virtual assistant, proposing solutions in real time, such as deciding when it may be time to swap out players or even going so far as to recommend how much water players should be drinking throughout the match. FC Barcelona is already piloting such applications in its lower division teams before rolling them out more widely.

6 tips to stay on the ball with AI

1. **Focus on principles.** You don't need to be a data scientist, but you do need to understand the underlying principles: what is your value proposition to customers, what are the key processes through which you create that, and how could AI help in those?

2. **Start small.** There are ready-made tools to get managers started using AI. Run pilot projects to understand the possibilities. Once you discover its value, then you can hire data scientists and run more customized, complex projects.

3. **Build cumulative advantage.** As with many digital tools, AI's power grows over time, through network effects and economies of scale. The sooner you start, the stronger your position will be, making it harder for laggards to replicate.

4. **Ensure quality data.** Make sure your governance structures give you access to the data you need. If collaborating with third parties, make sure your contracts specify ownership of the data insights.

5. **Manage algorithms in addition to people.** Learn to manage a portfolio of algorithms, knowing how and in which contexts they work best, and what potential biases they may have. You will be entrusting your teams to make decisions based on them.

6. **Seize the moment.** With tech costs falling all the time, the barriers to adopting AI have never been lower, while the COVID-19 crisis has made the need for radical business transformation more urgent than ever. Don't delay!

PERSONALIZED EXPERIENCES. AI is also being used to build stronger relationships with sports fans by offering more personalized, immersive user experiences. Take Wimbledon: the tennis tournament generates game highlights based on measuring player emotion and crowd reaction, and it uses chatbots to answer fan questions and smart assistants to give out ticket information and guide fans around the grounds. FC Barcelona uses AI to address mobility and security needs within its stadium to monitor how and where people congregate. Before the UEFA Euro 2020 soccer championship was postponed due to COVID-19, the Johan Cruyff Arena in Amsterdam was preparing a fully smart stadium, with thousands of sensors connected to seats, stairs, refreshment stands, parking lots and entrances to monitor crowd movements and flows, in order to ensure a smooth, safe, seamless experience for up to 80,000 visitors in and around the stadium.

While AI allows managers to do so much more than they ever could before, it does not and should not replace human beings in the decision-making process; it should be a case of the human and the machine working in sync. The machine can do analyses that far exceed human capabilities, yet those machine-generated insights need to be considered in concert with human experts, who create and feed the computational models in the first place. No matter how intelligent the system, its proposals must be approved by a person who takes the final responsibility. Although technology certainly has a role to play in management, never forget that management, whether of a sports team or of a business, is not something to be left to the sole discretion of a computer. ■

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