# Everyday AI: How artificial intelligence is shaping sports

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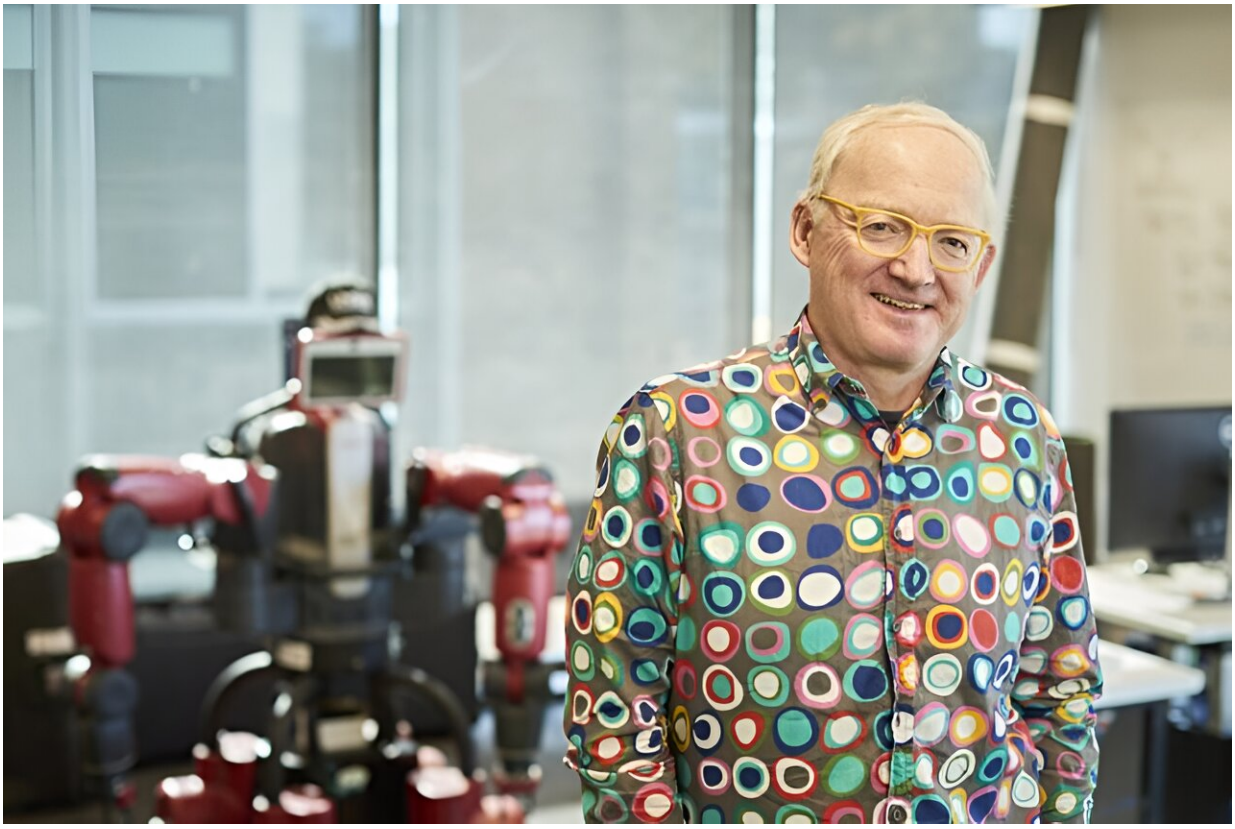

Professor Toby Walsh, Chief Scientist at UNSW's AI Institute. Credit: CSIRO

The hush of anticipation. The pop of a perfectly centered racquet hitting the ball. The sharp squeak of shoes scuffing against the court. These are the unmistakable sounds of a tennis match. We know them well. But

could you rely on these sounds alone to follow a match?

Courtney Lewis is a blind tennis player who relies on her hearing to play and watch games. But it's not always easy.

"It is very difficult, I have to zoom in on matches if I want to watch them," Courtney said.

"And even then, it's hard to keep up with where the ball is. So if I'm listening to it and I can know where it's landed and how it's been hit, it's going to be a lot more engaging."

One AI tool is helping blind and low-vision audiences follow games by applying sound effects to live tennis matches. This system, called Action Audio, turns data from real time monitoring of tennis ball movements into 3D sound so that blind and low-vision audience members can follow the game on sound alone.

It's just one example of how the way we watch or play sports is evolving thanks to AI.

## AI is on the moneyball

Sports is a numbers game. The points scored, the fouls, the players' ranks, the time between hits or shots or strokes. Many of these details can boil down to formulas for predicting or strategizing how a game may play out.

So it's unsurprising that AI systems have made their way through many elements of our favorite sports. They've revolutionized coaching, umpiring, and the watching of games.

Stuart Morgan leads the machine learning, AI and performance

technology group at the Australian Institute of Sport. His team builds AI tools that automatically provide insights analysts would otherwise have to do manually. Things like tactical game planning, player injury modeling and team formation.

One of their earliest adoptions of AI was driven by the coach of the men's hockey in 2010, Rick Charlesworth.

Rick was interested in disrupting the game by creating a competitive imbalance. His plan was to increase the interchange rate of his own players and increase the tempo of the game.

"Coaches often have a really strong intuition that something's right, but it's not always possible to measure that or empirically support their intuition," Stuart said.

So in came Stuart and his team of AI researchers. They built a system that was able to localize the players as they moved around the hockey pitch and measure how fast they were running, as well as the different formations of each team.

With the data they collected, they could then figure out if the changes the coach were implementing were actually working. And it was.

"It was an enormously successful strategy."

AI systems can be trained to look for and analyze the strengths and weaknesses of a particular athlete, assessing information like endurance, temperament, speed, flexibility, nutrition, their respiratory system, and more. And they can be applied to all kinds of sports.

**Watching like a Hawk-Eye**

In tennis, AI is improving the sport in several different applications. But one of the most prominent uses is in officiating.

According to Machar Reid, Head of Innovation at Tennis Australia, AI is transforming the roles of our umpires and referees.

"If we wind back the clock a touch, we're obviously relying on the human eye to call each and every ball on a tennis court," Machar said.

"And then along came this thing called Hawk-Eye in the early 2000s, which revolutionized, transformed the way that our sport went about officiating."

Hawk-Eye is a computer vision AI system that tracks the ball like a, well, you know. It lets the referee know if and when it has fully crossed a court or goal line.

It's now helping eliminate errors in scoring in a number of sports, including cricket, badminton, rugby union, volleyball, association football, Gaelic football, and even hurling. So how does it work?

"What it really involves is eight or ten cameras on each court essentially communicating with one another and tracking the ball as well as the player, 50 times a second. And then what happens is that by virtue of the way that the cameras are able to communicate with one another, you're able to provide a prediction or estimate, representing whether the ball was in or out on the tennis court," Machar said.

Note that word "estimate." Like any AI, Hawk-Eye isn't perfect. So just how accurate is it?

According to Machar, it's a lot more accurate than the human eye.

"We're talking about millimeters in and around how precise Hawk-Eye can become, whereas the human eye, you're probably talking closer to the centimeter type piece," he said.

"It can scale far more effectively than the human eye."

## The ethical elephant in the room

There's no question AI is revolutionizing sports and making the field more competitive, or more fair, or more accessible for our players.

All this AI must be trained on data to learn how to make decisions about line-calls, or player fitness, or the sound of a tennis match. And all that data comes from our athletes.

So how should we be thinking about the ethics of all this data collection, and where should we draw a line?

We explored this question with Professor Toby Walsh, Chief Scientist at the UNSW AI Institute. Toby says it's an important issue we need to consider as AI technology becomes more ubiquitous.

"It used to be that data was collected when you were on the playing field, when you were competing," Toby said.

"Then it was realized, of course, that it's worth collecting data when you're training and now data is collected even while you sleep. And that of course raises lots of risks about privacy and the like."

The challenge for us humans collaborating with AI is to build proper regulations and ethical boundaries around our work.

Provided by CSIRO