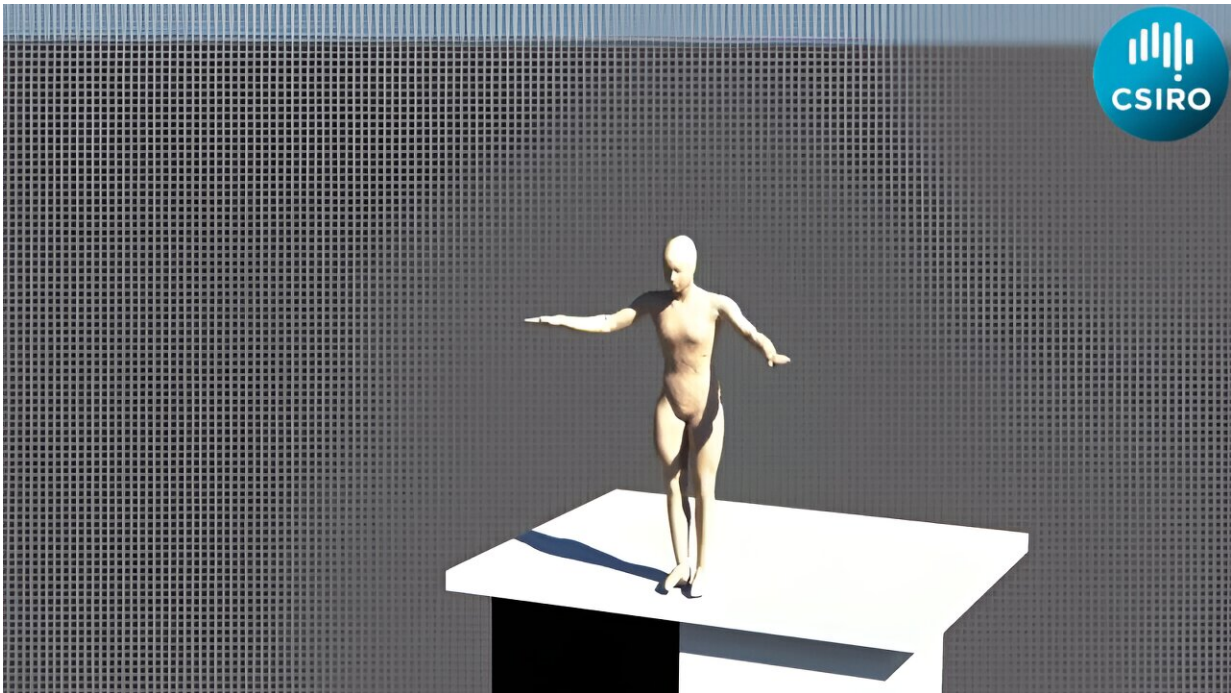


How science is changing the game in sports

May 15 2024, by Geoff Egan and Lucy Cameron



Digital twins of athletes allow athletes and coaches to evaluate performance and trial technique changes.

It's an open secret that the countries that win the most medals in the Olympics and Paralympics combine talent and technology.

Australia's athletes are preparing for the next three Olympics and Paralympics in Paris in 2024, Los Angeles in 2028, and Brisbane in 2032. Meanwhile, our sports scientists are developing [new technologies](#)

to help improve [sports performance](#) across a range of fields.

Emerging digital technologies like artificial intelligence and quantum sensing are now in play, as athletes look for a new kind of competitive advantage. Athletes, teams, and coaches across the world are exploring how AI-assisted tools can "up their game," improve performance and reduce injuries.

Some of these technologies could come to your local club before you know it. Software offering insights into athletic performance and strategy is becoming more accessible, and AI-powered officiating is on the horizon. Soon, AI could be the third umpire at your local cricket match.

AI could help athletes stay healthy and recover faster

Each [athlete](#) has unique biochemistry, psychology, and physiology. They respond to working out, nutrition, and competition differently. Its why high-performance training is becoming increasingly personalized.

An athlete-centered approach to training and development was first developed in the para-athlete areas. Now it's being transferred to able-bodied sports with the assistance of [digital technologies](#).

Eagle-eyed sports fans may have noticed footballers from multiple codes wearing vests under jerseys, or devices stitched in jerseys between their shoulder blades. These biometric trackers can provide information for coaches to monitor individual performance. This data can be combined with AI to improve performance, prevent long- and short-term injury, and optimize training.

Quantum sensors can profile the biochemistry of athletes in new ways. Quantum technology opens a range of outcomes such as different plays

for injury prevention. It can also be used in drug testing, providing faster and more accurate testing than the current methods.

Combining large and disparate datasets from wearables, cameras, and body samples, sports scientists are creating digital twins of athletes that can be tested in various environments to predict performance. The digital replica can also be tweaked to advise on nutrition, technique, and strategy.

For example, a digital twin may be able to test variations of techniques to find the optimum way for a swimmer's body to move through water. A rower may be able to test multiple variations on their technique to improve their performance.

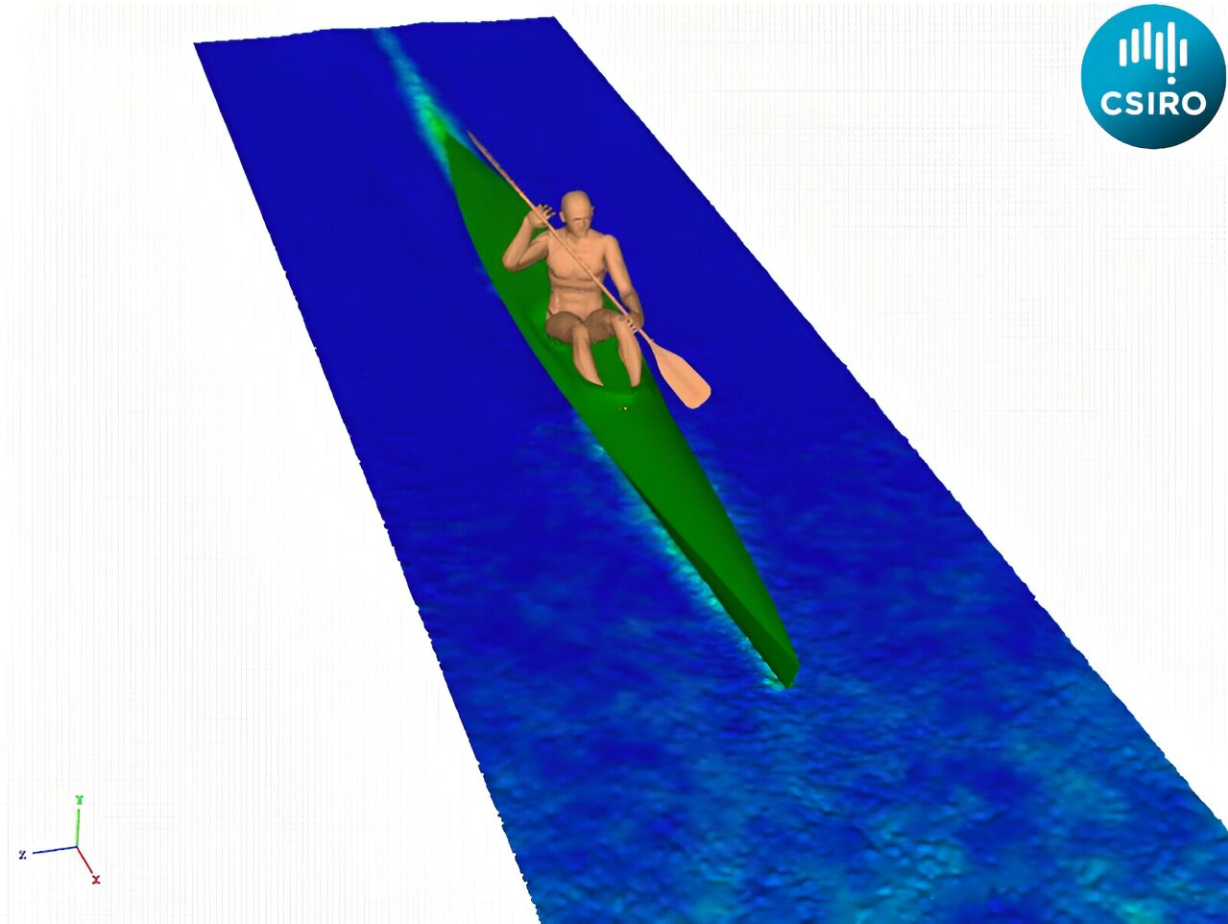
AI could drive better sports analytics

Looking for insight into what science has brought to sport? You don't need to look further than your TV.

Sophisticated player analytics are included in most major sports broadcasts. Gone are the days when the only statistics you saw in a footy game or cricket match was the score. Player performance and tracking are regularly updated on NRL and AFL matches. Cricket and tennis popularized ball-tracking technology.

Networks of on-field sensors and cameras capture computer vision of play. This can be combined with AI to analyze new dimensions of player and team performance, leading to adjustments in training and coaching. AI is also being used to inform players of their opponent's strengths and weaknesses mid-match.

AI can even [assist in officiating](#)—providing extra eyes and angles to determine line calls and whether players are onside or offside.



Using digital twins sports scientists can evaluate various changes to techniques to allow athletes in sports like kayaking perform at their best.

AI could level the playing field

And it's not just elite athletes that are benefiting from [sports science](#). Parents and amateur coaches can use low-cost player vision, captured on apps on smartphones and tablets, to provide information on team dynamics and play.

More sophisticated setups include dynamic heat-maps of the play on the

field and game analytics. There are existing coding libraries that can offer more tailored analytics and visualizations. Greater access to coaching information also necessitates stringent safeguards concerning the ethics, privacy, and usage of data and images, particularly for children in sport.

Volunteer-run local sporting competitions often struggle to find umpires and referees, AI officials could provide volunteer umpires and referees with computer-powered backup. Amateur players could have access to an AI-powered video umpire to confirm controversial decisions.

The use of video and AI in officiating has become [controversial in some areas](#) of high-performance sport. But it could show its true potential as it becomes [available to leagues at all levels](#).

AI can keep our exercise goals on track

If you use an app to log your morning run or ride, you could already be part of the data-driven revolution in sport.

Digital technologies are changing the way people experience sports. Apps for running, cycling, and training are engaging a new generation of exercise and sports enthusiasts.

Wearable devices, most notably smart watches, are helping people track their exercise to understand their progress over time better and encourage them to work out. AI can help personalize workouts to a person's fitness levels and goals. AI-powered pose estimation tools can act as a personal yoga instructor, helping correct poses or techniques.

But AI could be an ethical sticky wicket

However, some [ethical concerns](#) remain. Is too much information skewing athletes' intuitive skills or undermining their confidence?

Our Collaborative Intelligence Future Science Platform is exploring the science of human-AI collaboration. The team is researching how AI can be best incorporated into the human workflow. The focus is on ensuring a shared understanding of the situation that the human and AI are collaborating on, and instilling trust throughout the process. Research programs like this can examine how athletes use and respond to available data, ensuring that the sports technologies are being applied correctly.

The ethics of using personal data from athletes are also evolving to ensure technologies are trusted and safe. In 2020 a group of organizations, led by the Australian Academy of Science, published a report [Getting ahead of the Game](#). It highlighted growing concern about sensitive health data being collected from athletes through digital and other technologies.

Since then, the Australian Sports Commission and Australian Institute of Sport have been proactive in developing position statements and safeguards for certain technologies in sports training programs. This is about the use of athlete data in terms of privacy, safety and cybersecurity, and ensuring that data is not used for any purpose without consent.

As we continue embarking on a world of technology in sport science, it is important to grow the next generation of graduates skilled and enabled in the AI, emerging technologies and quantum space. We are still highly active in sports science fields.

Provided by CSIRO

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