

# THE NETHERLANDS AND BRAZIL

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in science, technology  
and innovation



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Combine data science and sport science to help soccer teams become successful. Researchers from the Brazilian University of Campinas (UNICAMP) and the Dutch University of Groningen (RUG) are taking the first steps toward this goal in their project 'The secret of playing football: Brazil versus the Netherlands'.

Pelé, Neymar, Crujiff, and Van Basten. These surnames refer to some of the greatest Brazilian and Dutch soccer players of all time. Is it possible to quantify what makes a soccer player successful and how this talent develops over the years? And could a combination of data science and sports science lead to the development of a coach's cockpit to optimize the team's performance during the match? To answer these questions, sport scientists Koen Lemmink (RUG) and Sergio Cunha (UNICAMP) joined forces with computer scientist Ricardo da Silva Torres, who in 2019 transferred from UNICAMP to the Norwegian University of Science and Technology.

The collaboration started with Dutch researcher Koen Lemmink taking part in a delegation to Brazil organized in 2016 by the Dutch Ministry of Foreign Affairs. 'I did not know

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**Sergio Cunha**  
University of Campinas

Sergio and Ricardo before. But when I asked European colleagues whom I should be talking to in Brazil, theirs were the names they mentioned. When in Brazil I first met Felipe Moura, whose name I knew from scientific papers.' 'I had been working with Felipe before,' Brazilian scientist Sergio Cunha adds. 'He connected all of us. Very soon after, we started to write this proposal for a FAPESP/NWO project together.'



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**Ricardo da Silva Torres**  
Former UNICAMP and since 2019 Norwegian  
University of Science and Technology

### COLLECTING DYNAMIC DATA

In their joint project, the scientists are developing new ways to quantify and then characterize what is going on during soccer matches. They collect data about the match itself, the tactics, and movements and physiological properties of individual players. Cunha: 'Through a video surveillance system and radiofrequency antenna's, we track the ball's and players' movements with great accuracy. We use these data about velocities, accelerations, passes and other tactical moves to study practical and tactical elements of the play.' Lemmink: 'We also used data with information from videotaped matches from the Dutch premier league. All in all, we have a vast amount of data both on the level of individual players, on the interactions between them in subgroups or teams, and on how those affect the play and lead to success. Now we are looking for deeper ways to use these dynamic data to quantify what is happening on the field, and how a coach could influence that.'

The project focusses both on physical and tactical parameters of soccer. The researchers not only study how fatigue influences the performance of individual players, but also how players cooperate on the field and how that affects their opponents' behavior. In the end, the project aims to compare playing styles between the two countries. Cunha: 'Brazilian soccer players tend to play based on intuition, whereas in Dutch teams, often predefined tactics are key. Determining what variables are needed to describe the differences adequately is one of the first major challenges to overcome.'

### USING NETWORK THEORY TO SCORE A GOAL

Both Torres and Cunha spent a year in the Netherlands as part

of this collaboration. Cunha: 'In Groningen I studied the concept of dribbling. For our models to distinguish dribbling from running or walking, we need an accurate definition of what dribbling actually is in physical and technical terms.' 'From a computer science point of view, we want to know how we can advance the state of the art in computer science in order to help advance the state of the art in sport science,' Torres explains. 'We are for example looking at different ways of encoding the relationship between players over time. We use complex network theory where the relationships are represented by so called graphs, and players are characterized as nodes. Now we need to determine which network indicators are most useful to describe the dynamics between the players. Eventually, we want to use this network description to deduce how certain tactical decisions can lead to desired actions in the field, such as getting close to scoring a goal.'

This project is one of the first worldwide to truly integrate sports science with data science and computer science. 'This is a very promising approach with major potential for other sports as well. We can for example easily extend our method to futsal or handball,' says Cunha. Lemmink: 'The funny thing is that I needed to go to Brazil to discover the possibilities of involving computer scientists in my work, also in the Netherlands. As a result of this project, the department of Human Movement Sciences in Groningen recently even hired a full-time data scientist. This project undoubtedly is the start of something bigger.' 'It is my hope that we will eventually build a worldwide network of collaborating sports and computer scientists. That combination opens up so many other opportunities for interesting studies,' Torres concludes.

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**Koen Lemmink**  
University of Groningen

### READ MORE

#### Description of the project on the website of FAPESP:

<https://bv.fapesp.br/en/auxilios/97539/the-secret-of-playing-football-brazil-versus-the-netherlands/>

#### Jointly written review:

<https://read.qxmd.com/read/32297547/unlocking-the-potential-of-big-data-to-support-tactical-performance-analysis-in-professional-soccer-a-systematic-review>