DIGISPORT, a unique Graduate School of international excellence.

The digital revolution in sports and exercise is already underway and creates a demand for skilled professionals able to bridge the gaps between the different scientific fields covered by DIGISPORT. Our objective is to train a new generation of highly-qualified students ready to take on these specific challenges.

DIGISPORT offers a comprehensive, hybrid training program encompassing the specialties in both sport and digital sciences. At the masters and doctoral levels, students are offered the opportunity to build a study strategy suited to their professional goals and to the labor market.

DIGISPORT’s training program is strongly linked to research and innovation. The Rennes ecosystem is in fact particularly well suited to host DIGISPORT, as it incorporates world-class research units. In order to conduct interdisciplinary projects, students benefit from a unique access to dedicated cutting-edge technological platforms.

DIGISPORT aims at strengthening partnerships between academic institutions, industry and society to boost employability and lifelong learning. By joining the DIGISPORT socio-economic network, companies have access to a multitude of partnership opportunities.
The digital revolution in sports and exercise is already underway, at the confluence of the fast-growing markets of sport, digital technology and connected objects. It leads to the emergence of new professions at the interface of these domains requiring skills in sports science, computer science, electronics, data science and human & social sciences.

Project Holders

Benoit BIDEAU
Managing Director

Françoise RANNOU BEKONO
Training Director

Richard KULPA
Science Director
FIVE FIELDS COVERED BY DIGISPORT

- SPORT SCIENCE
- ELECTRONICS
- COMPUTER SCIENCE
- DATA SCIENCE
- HUMAN & SOCIAL SCIENCES
OUR ACADEMIC & SCIENTIFIC PARTNERS

UNIVERSITIES

**University of Rennes** (Mathematics & ICT, Life & Health Sciences, Material Sciences, Humanities & Social Sciences)

**University of Rennes 2** (Arts, Literature & Communication, Modern Languages, Human Sciences, Social Sciences, Sport Sciences)

GRANDES ÉCOLES

**ENS Rennes** (Economics-Law-Management, Computer Science, Mathematics, Mechatronics & Sport Sciences)


**ENSAI** (Statistics & Data Science)

**CentraleSupélec** (Sciences & Engineering)
RESEARCH ORGANIZATIONS

**CNRS** (French National Center for Scientific Research)

**Inria** (National Institute for Research in Digital Science and Technology)
## RESEARCH-BASED TRAINING

1. **CREATE IN-SITU KNOWLEDGE**

   How to create knowledge outside the laboratories, as close as possible to athletes or patients and on all performance factors (physiological, biomechanical, psychological).

2. **REVOLUTIONIZE PRACTISE & REHABILITATION**

   How to use this knowledge to revolutionize the practice of physical activity for both athletes (to improve their performance and management of complex gambling situations, prevent injury, and accelerate rehabilitation).

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### SCIENTIFIC CHALLENGES

DIGISPORT brings together 26 research units in the fields of sport, computer, data, electronic, human and social sciences. They share a common scientific goal and cooperate to create a new training curriculum anchored in scientific and economic reality.
SCIENTIFIC CHALLENGES

INTERDISCIPLINARITY

- Sport sciences
- Data science
- Computer science
- Electronics
- Human & social sciences

MOBILE LABORATORY

- MULTIMODAL SENSORS
- MODELING & ANALYSIS
- PERFORMANCE INDICATORS

CREATE IN-SITU KNOWLEDGE

REVOLUTIONIZE PRACTICE AND REHABILITATION

IMPACT ON PRACTICE & SOCIETY

NEXT GENERATION OF TRAINING TOOLS

HUMAN FACTORS

NEW TRAINING TOOLS

TRAINING METHODOLOGY

PERFORMANCE INDICATORS

IMPACT ON PRACTICE & SOCIETY

HAPTIC

VR/AR

NEURO-FEEDBACK

HUMAN FACTORS

NEW TRAINING TOOLS

TRAINING METHODOLOGY
Sport and exercise performance is eminently complex and multifactorial. While laboratory-based scientific studies are typically associated with increased measurement precision and enhanced quality control, studies involving quantification of field-based measures are increasingly popular in the sport sciences as they increase our understanding of this complexity. Opportunities to continue bridging the gap between practice and research are possible by creating and improving precision systems for the measure and interpretation of performance in the field. Creating such mobile laboratories is necessary to move forward and collect reliable data from realistic situations. This involves addressing a large number of scientific challenges in various topics:

- **Multimodal sensors** (extreme conditions, energy capacity, sustainability, transmission...)

- **Signal processing and modeling** (complex structures, confidence indices, game strategies...)

- **Analysis / Performance indicators** (high-level information, segmentation-recognition-evaluation...)

Predicated on an improved knowledge of data acquired in realistic situations, the next step consists of developing tools to translate this knowledge into understandable and helpful information for users, whether they are athletes hoping to improve their performance or monitor their progress in rehabilitation, or people suffering various acute or chronic pathologies wanting to monitor their health. It is therefore necessary to propose the next generation of innovative training/rehabilitation methodologies and tools.

- **Training methodology** (efficient, understandable & interpretable feedback, adaptive and individualized learning processes, digital coach...)

- **New training tools** (ecological approach, multimodal feedback, transfer of skills to real situations...)

- **Human factors** (pertinence of innovation, assessment of design choices...)

- **Impact on practice and society** (digital social comparison, user communities...)

CREASE IN-SITU KNOWLEDGE

REVOLUTIONIZE PRACTISE & REHABILITATION
In September 2022, a new master degree program in Digital Sport Sciences was created, structured around interdisciplinary academic major and minor fields of study. This «Digital sport sciences» master degree aims at training students with a strong competence relevant to two disciplines including at least one in the sport sciences field.

The majors are composed of mandatory and elective courses to deepen the knowledge of each student’s initial field of study (e.g. sport sciences, digital or electronic sciences).

Minors will enable the acquisition of complementary skills in another field (e.g. digital science for sport sciences students and conversely) and will allow students to build a unique profile tailored to their aspirations and competences.
The Digital Sport Sciences master degree is built on a competency-based approach. These competencies can be grouped into 4 different interdisciplinary profiles:

- **METROLOGY OF HUMAN MOVEMENT & INNOVATIVE SENSORS**
  The «Metrology of human movement & innovative sensors» major focuses on developing new generations of sensors to overcome sport and exercise constraints.

- **ANALYSIS, MODELING & SIMULATION OF HUMAN MOVEMENT**
  The «Data science applied to sport» major is particularly suited for students wanting to analyze, model and simulate the human movement in order to comprehend and optimize sport performance.

- **DATA SCIENCE APPLIED TO SPORT**
  The «Data science applied to sport» major focuses on exploiting digital data in sport using mathematical and statistical methodologies in order to extract indicators of performance and risk injury, among others.

- **DIGITAL SOLUTIONS FOR INTERACTION IN SPORT**
  The «Digital solutions for interaction in sport» major focuses on the latest scientific and technical methodologies of computer science coupled with the underlying processes of performance in order to develop new generations of tools to analyze and build better movement in sport.
MASTER - STRUCTURE

Semester 1
- REFRESHER COURSES (2 electives)
- DIGITAL SPORT SCIENCES COURSES (mandatory)
- MINOR - SPECIALIZATION OR DIVERSIFICATION COURSES (1 elective)
- PROJECT (mandatory)

Semester 2
- DIGITAL SPORT SCIENCES COURSES (mandatory)
- MAJOR - SPECIALIZATION COURSES (2 electives)
- INTERNSHIP (5 to 6 weeks)
- MINOR - SPECIALIZATION OR DIVERSIFICATION COURSES (3 electives)
- PROJECT (mandatory)

Semester 3
- DIGITAL SPORT SCIENCES COURSES (mandatory)
- MAJOR - SPECIALIZATION COURSES (3 electives)
- EXTRA COURSES (2 electives)
- MINOR - SPECIALIZATION OR DIVERSIFICATION COURSES (2 electives)
- PROJECT (mandatory)

Semester 4
- INTERNSHIP (4 to 6 months)
- EXTRA COURSES (2 electives)

MAJOR (90 ECTS)

MINOR (30 ECTS)
COURSES - SEMESTER 1

REFRESHER COURSES (2 electives)
- Statistical modeling
- Algorithms and programming
- Introduction to exercise physiology and biomechanics
- Scientific basis of physical preparation

CORE COURSES (mandatory)
- Biomechanics of human movement
- Integrative exercise physiology
- Databases management
- Data visualisation
- Sport in the digital age
- Professional interaction
- Language course

MINOR COURSES (1 elective)
- Methodology for the optimization of training
- Pairing of physiology and biomechanics for the athlete’s analysis
- Psychosocial processes and physical behavior
- Sensors and evaluation of physical behavior
- Sensors and instrumentation
- Introduction to virtual reality
- Linear models
- Supervised learning

COURSES - SEMESTER 2

CORE COURSES (mandatory)
- Methods and instruments for the assessment of performance
- Modeling and simulation of movement
- Tutoring
- Professional interaction

MAJORS (1 major to elect)
- Metrology of human movement and innovative sensors
- Sensors and instrumentation - Advanced
- Modeling and simulation of movement - Advanced
- Digital solutions for interaction in sport
- C++ programming - Software engineering
- Analysis, modeling and simulation of movement
- Modeling and simulation of movement - Advanced
- Biomechanics of human movement - Advanced
- Data science applied to sport
- Data mining - Duration models

MINOR COURSES (3 electives)
- Courses from the majors not elected by the student, as well as:
- Methodology of training and physical preparation
- Training and movement efficiency
- Training engineering
COURSES - SEMESTER 3

CORE COURSES (mandatory)
- Digital tools and monitoring of training load
- Research methodology
- Seminars/workshops

MAJORS

Metrology of human movement and innovative sensors
- Emerging technologies for performance
- Sensors and instrumentation - Expert
- Design engineering

Digital solutions for interaction in sport
- Data mining and clustering
- Computer science complementary skills 1
- Computer science complementary skills 2

Analysis, modeling and simulation of movement
- Emerging technologies for performance
- Human-machine cosimulation
- Sensors and instrumentation - Expert

Data science applied to sport
- Data mining and clustering
- Statistical learning
- Deep learning

COURSES - SEMESTER 3

MINOR COURSES (2 electives)
- Courses from the majors not elected by the student, as well as:
- Fatigue and recovery strategies
- Minor courses from Semester 1

COURSES - SEMESTER 4

Semester 4 is dedicated to the end-of-studies internship that should be completed in a company or in a laboratory in France or abroad.

The DIGISPORT program offers non-conventional teaching with online delivery, flipped classrooms, research teaching, pedagogy-by-doing and co-working, and relies heavily on interdisciplinary projects carried out in collaboration with scientific and economic actors to also encourage hybridization of student populations.
DOCTORATE

After completing their DIGISPORT master degree, students are given the opportunity to pursue doctoral activities in France or abroad.

DIGISPORT aims at delivering a cohesive doctoral training program to its PhD students in addition to the one delivered by doctoral schools. DIGISPORT also offers thesis grants and delivers PhD degrees in association with its partner doctoral schools.

Examples of theses funded or labelled by DIGISPORT:

→ Analysis of complex functional data in swimming (in association with the French Swimming Federation)

→ Origins and consequences of fatigue during prolonged exercise of variable intensity (in association with the cycling team Sojasun Espoir ACNC)

→ Sport & cancer in the digital age

→ Development of autonomous sensors for the quantification of an athlete’s movement in indoor sports
Installed on the Villejean Campus (University Rennes 2), the PhD Lab is a space where PhD students can gather together and exchange about their research activities.

The objective of this laboratory is to foster the creation of an interdisciplinary community by bringing together students working in different research partner teams in order to encourage methodological and theoretical synergies between the various fields covered by DIGISPORT.

This PhD Lab is composed of two spaces on the Villejean Campus: a technological platform and a coworking room.
DIGISPORT wishes to strengthen the relation between its students and sport and technological companies through the creation of a DIGISPORT socio-economic network. Being part of this network allows companies to be a active actor of the training and research program of DIGISPORT through different types of collaboration.

Socio-economic actors involved in the DIGISPORT network can thus benefit from a pool of versatile and highly-skilled students able to tackle the new challenges companies face in the digital age of sport.

Students can, through this network, get a foothold in the business environment and discover the different career opportunities they will have once graduated from the DIGISPORT training program.

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### THE DIGISPORT EXPERIMENTAL PLATFORM

Equipped with motion capture cameras, force plates, ergocycles, electromyograms, VR headsets,...

- Analysis and modeling of the human movement
- Development of sensors
- Optimisation of performance
- Development of new data-processing tools

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### TYPES OF COLLABORATION

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CAREER OPPORTUNITIES

SPORT DATA SCIENTIST
RESEARCHER
R&D ENGINEER
SPORT DATA ANALYST
PERFORMANCE MONITORING MANAGER
ADVANCED SIMULATION ENGINEER
COMPUTER SCIENTIST IN E-SPORT
ENGINEER IN HEALTH CENTERS
PERFORMANCE ANALYSIS DIRECTOR
...

Non-exhaustive list
DIGISPORT promotes the enrolment of national and international students through competitive scholarships each year, language courses offered to foreign (French) or native (English) students and courses taught in English.

National and international PhD students are funded by academic PhD contracts - some of which co-supervised internationally - at the rate of competitive fellowships each year. Industrial PhD contracts will benefit from co-supervision between academic and industrial partners.

In addition, outgoing researcher fellowships will be funded to further develop an international network and to increase partnerships in research and training. The researchers will be mobilized to participate in our thematic schools, courses, student mentoring and student project evaluations.
DIGITAL SPORT SCIENCES

To request any further information about DIGISPORT, feel free to contact us at: digisport@univ-rennes.fr