

PhD position:

Human activity analysis and its interaction with the physical world using monocular computer vision

Application to sports performance support and physical risk prevention



Location: [MIA](#) laboratory, La Rochelle University, West coast of France.

In the context of the European University [EU-CONEXUS](#), the applicant will have the possibility to spend several months at the Waterford Institute of Technology, Ireland (costs covered by EU-Conexus).

Keywords: Computer Vision, Deep Learning, Human activity, Sport, Well-being.

Context: The analysis of human activity and gesture is often confined to laboratory studies and data obtained using sensors are generally accurate but often disconnected from the practice at sports grounds. Moreover, outdoor physical activities make it necessary to find acquisition solutions without markers or equipment that can alter human performance and gestures. Computer vision and Machine Learning can provide a valuable help to this problem by using information from images or videos only.

The objective of the proposed thesis is to provide advanced methods in computer vision and IA allowing the study of human activities and its interaction with its physical environment. More precisely, we will study the problem of human/object interaction, and the estimation by monocular vision of the kinematic and force parameters involved in these interactions. An important scientific problem is the estimation of these 3D physical parameters only from a 2D video acquisition.

Two main application fields are targeted:

- The first one is *Sports Performance Support*. Vision is indeed the first indicator of a trainer to assess the efficiency of a sport gesture. We aim at developing methods in computer vision to allow: the acquisition, the recognition, and the analysis of gestures in sports involving an interaction with an object (balls, rackets, bats, etc.).
- The second area is the *Factory of the Future*, where the reduction of musculoskeletal disorders (MSD) and the improvement of workstation performance will be major objectives. During assembly line work, stress and musculoskeletal disorders cause many occupational diseases in operators. Being able to analyze the operator's posture and study his movements will reduce these risks.

These two themes are linked to sport, health, and well-being. In these two cases, vision is a source of non-invasive information that avoids disturbing the athlete or the worker in his task.



Qualifications:

Master in Computer Sciences or Applied Mathematics with Majors in Machine Learning, Data Science and Computer Vision. Strong skills in programming (python) are required.

Contacts:

If you are interested to apply to this PhD position, please send:

- a resume with your grades
- a letter detailing your motivation to pursue a PhD on this topic

to:

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Funding:

The PhD is funded by the French government for a 3-year duration, starting from October 2022. Possibility to be teaching assistant with extra salary.