

# Situated Data Visualizations for Sports Videos

## Master 2 Internship

**Starting date:** February/March 2025

**Duration:** 6 months

**Supervisor:** Romain Vuillemot, Assistant Professor

**Location:** Ecole Centrale de Lyon, Ecully, France

**Keywords:** Web development, Data visualization, Sports data analysis

**Laboratory:** LIRIS Laboratory, UMR 5205

**Funding:** 650€ / month

**PhD follow-up:** Yes

### Context

The internship will take part of the SportsViz project<sup>1</sup>, which is an ANR-Funded project from 2025-2029. The goal of the project is to design a novel generation of data visualization to be embedded in sports videos. The motivation for this project is that while data as visualization have a strong narrative and analytical power for sports analysis [3], they currently are not integrated where and when they are relevant in videos. The standard way scientists or broadcasters display data is using visualizations inserts *superimposed* on the video rather than *situated* into the sports 3D scene e. g., on the wall, leveraging the physical context to show the progress, emphasize key performance factors (e. g., forces, speed) and put them in perspective with competitors. The resulting situated visualization would enable an informed decision-making process to make strategic choices, but also would engage a broader audience such as sports fans [2] while preserving and enhancing the viewing experience.

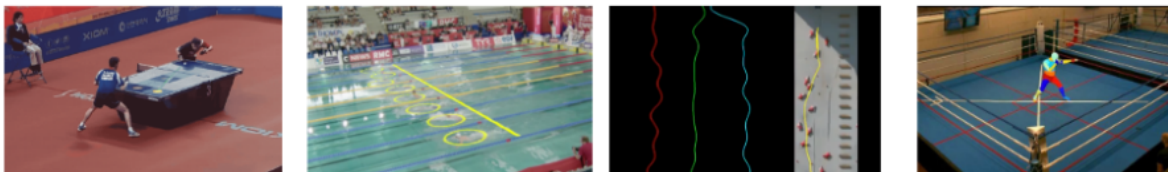


Figure 1: Example of sports situated visualizations for table tennis, swimming, climbing and boxing.

### Goals

The goal of the internship is to design novel situated sports visualizations similar to Figure 1 using existing tracking data and 3D scene sports models. Such data are already available through previous research projects collected for the 2024 Olympics and through the SportsViz project (Axe2: 3D Scene Reconstruction, supported by a research engineer). We expect the internship to follow the steps below:

1. Conduct and write a comprehensive review of existing work on situated visualizations for sports by the research community e. g., [1, 5, 4].
2. Prototype and implement examples of novel situated videos similar the one illustrated on Figure 1 but based on 3D scene reconstruction.
3. Build an authoring tool (i. e. user friendly interface) that enables to customize visualizations and that can be used by designers and sport partners (e. g., sports Federation, coaches, athletes).
4. Write a research report on the feedback and evaluation process we expect to submit to a top visualization venue such as IEEE Vis, ACM CHI or Eurographics by the end of the internship.

We also expect the internship to continue as a PhD program on the same topic.

<sup>1</sup><https://projet.liris.cnrs.fr/sportsviz/>

## Requirements

Due to the technical nature of the work, we expect the candidate to have strong programming skills, particularly in front-end technologies such as JavaScript and data visualization libraries (e.g., D3<sup>2</sup>) and/or 3D frameworks (e.g., ThreeJS<sup>3</sup>). Additional interests in design, video processing, and sports data analysis are highly considered. Candidates with experience in video game development, sports analytics, or software development are also of interest. The candidate should demonstrate a strong motivation for conducting research, with the potential for pursuing a career in academia and/or teaching. The candidate should be proficient in English writing and oral communication. Please note that recruitment for the SportsViz project requires a referral through the FSD (Fonctionnaire Sécurité Défense).

## Contact

To apply please send a CV, your Master grades and a cover letter to [romain.vuillemot@ec-lyon.fr](mailto:romain.vuillemot@ec-lyon.fr). We will review the applications on the fly so you may apply or contact us as soon as possible.

## References

- [1] Z. Chen, S. Ye, X. Chu, H. Xia, H. Zhang, H. Qu, and Y. Wu. Augmenting Sports Videos with VisCommentator. *IEEE Transactions on Visualization and Computer Graphics*, 28(1):824–834, Jan. 2022. Conference Name: IEEE Transactions on Visualization and Computer Graphics.
- [2] T. Lin, Z. Chen, Y. Yang, D. Chiappalupi, J. Beyer, and H. Pfister. The Quest for Omniculars : Embedded Visualization for Augmenting Basketball Game Viewing Experiences. *IEEE Transactions on Visualization & Computer Graphics*, 29(01):962–971, Jan. 2023. Place: Los Alamitos, CA, USA Publisher: IEEE Computer Society.
- [3] C. Perin, R. Vuillemot, C. D. Stolper, J. T. Stasko, J. Wood, and S. Carpendale. State of the Art of Sports Data Visualization. *Computer Graphics Forum (EuroVis’18)*, 37(3):663–686, 2018.
- [4] L. Yao, A. Bezerianos, R. Vuillemot, and P. Isenberg. Situated Visualization in Motion for Swimming. In *Journée Visu 2022*, Bordeaux, France, June 2022.
- [5] L. Yao, R. Vuillemot, A. Bezerianos, and P. Isenberg. Designing for Visualization in Motion: Embedding Visualizations in Swimming Videos. *IEEE Transactions on Visualization and Computer Graphics*, 30(3):1821–1836, Mar. 2024. Publisher: Institute of Electrical and Electronics Engineers.

## About

**Ecole Centrale de Lyon (<https://www.ec-lyon.fr/en>)**. École Centrale de Lyon, founded in 1857, is one of France’s oldest and most prestigious engineering schools, known for its rigorous generalist engineering program that blends theoretical knowledge with practical experience. Located in Écully, near Lyon, the school offers a diverse curriculum with specializations in fields like mechanics, energy, and environmental engineering, and is deeply involved in cutting-edge research. With strong international partnerships and a vibrant campus life, graduates of École Centrale de Lyon are highly sought after by leading companies in engineering, technology, and consulting.

**LIRIS Lab (<https://liris.cnrs.fr/en>)**. The Laboratoire d’InfoRmatique en Image et Systèmes d’information (LIRIS) is a joined research unit (UMR 5205) backed by the CNRS, INSA Lyon, University Claude Bernard Lyon, University Lumière and Ecole Centrale de Lyon. It has 330 members. LIRIS research addresses a broad spectrum of computer science within its 12 research teams structured

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<sup>2</sup><https://d3js.org/>

<sup>3</sup><https://threejs.org/>

in 6 poles of expertise from database to vision and human-computer interactions.

**Inria (<https://inria.fr/en>).** The National Institute for Research in Digital Science and Technology (Inria) (French: Institut national de recherche en sciences et technologies du numérique) is a French national research institution focusing on computer science and applied mathematics.