Willing to experience intersectoral, interdisciplinary and/or international research? Apply with Centrale Nantes to the MSCA Postdoctoral fellowship 2025 call for proposals and join us!

Candidate profile

We are seeking a highly motivated Postdoctoral researcher with a PhD in Robotics, ideally with expertise in medical robotics, physical human-robot interaction, or haptics. The ideal candidate should have experience in collaborative robotic systems, motion control strategies (e.g., impedance/admittance control, kinematic redundancy), and the integration of imaging technologies, such as ultrasound, with robotic platforms. A background in designing and validating robotic systems for medical applications, along with knowledge of clinical workflows, is highly desirable. Strong problem-solving skills, effective communication, and the ability to work in multidisciplinary teams are essential.

Project description

Supervisor: Juan SANDOVAL

Keywords: medical robotics, physical human-robot interaction, haptics

Topic open:

The PercuCob project, led by Centrale Nantes and the LS2N Laboratory (RoMaS team), aims to develop a comanipulated robotic assistant suitable for ultrasound-guided percutaneous interventions. In particular, cryoablation is a minimally invasive procedure using extreme cold to destroy abnormal tissues in regions such as the liver, kidney, or lung. The procedure involves the insertion of multiple cryoprobes, which are placed around the targeted area to create a freezing zone capable of killing cells. While cryoablation is a widely used and safe technique, its success heavily depends on the precise placement of cryoprobes to ensure a uniform and controlled distribution of cold temperatures within the targeted area. Probe placement is guided by imaging modalities such as ultrasound, CT scans, or MRI, depending on the medical case [1].

This post-doc focuses on the development of a robotic assistant to improve the accuracy and efficiency of cryoprobe placement during cryoablation. The robotic tool's distinctive feature is its adaptability, allowing reconfiguration based on the puncture axes of the probes to enhance precision. The research objectives include:

- Studying the medical gesture to identify the workspace and medical constraints necessary for the robotic assistant's design.
- Designing a robotic tool capable of adapting to varying puncture axes, ensuring optimal placement of multiple cryoprobes.
- Customizing and controlling a redundant collaborative robot to carry the robotic guide tool, adopting a macro-mini robotic architecture [2]. This includes developing impedance/admittance control strategies and exploiting kinematic redundancy to ensure safe and effective comanipulation during both preoperative and intraoperative phases [3].
- Integrating imaging technologies such as ultrasound and CT into the robotic system, enabling real-time guidance and precise alignment with the anatomical features of the targeted tissue.
- Validating the robotic assistant through studies that assess its performance, precision, and safety within clinically relevant scenarios.

[] Kwak K, Yu B, Lewandowski RJ, Kim DH. "Recent progress in cryoablation cancer therapy and nanoparticles mediated cryoablation. Theranostics". 2022 Feb 14;12(5):2175-2204. https://doi.org/10.7150/thno.67530

[2] Labrecque, P.D., Laliberté, T., Foucault, S., Abdallah, M.E., Gosselin, C. "uMan: A Low-Impedance Manipulator for Human–Robot Cooperation Based on Underactuated Redundancy," in IEEE/ASME Transactions on Mechatronics, vol. 22, no. 3, pp. 1401-1411, June 2017. https://doi.org/10.1109/TMECH.2017.2652322

[3]Koszulinski, A., Sandoval, J., Vendeuvre, T., Zeghloul, S., and Laribi, M. A. (June 16, 2022). "Comanipulation Robotic Platform for Spine Surgery With Exteroceptive Visual Coupling: Development and Experimentation." ASME. J. Med. Devices. December 2022; 16(4): 041002. https://doi.org/10.1115/1.4054550

Call information

Organisation	Ecole Centrale Nantes
Research field(s)	Robotics
Researcher Profile	R1 – First stage researcher or R2 – Recognised researcher
Country	France
Application deadline	31 March 2025
Type of contract	Temporary
Job status	Full-time
Hours per week	39
Offer starting date (estimated)	1 Apr 2026
Is the job funded through the EU Research Framework Programme?	Horizon Europe – MSCA European Postdoctoral Fellowship

Research environment

Centrale Nantes is a top-ranked institution recognized internationally for its excellence in research and education, particularly in engineering and technology. It is known for its leadership in fields such as **marine engineering**, **civil engineering**, and **mechanical engineering**, frequently appearing in the upper echelons of global rankings. For example, it ranks **125th worldwide in Mechanical Engineering** according to the **QS World University Rankings by Subject 2024**, reflecting its prominence in this area.

Additionally, Centrale Nantes is positioned in the **top 300 globally for Engineering,** and in the **top 500 for Physical and Computer Sciences** in the **Times Higher Education World University Rankings by Subject 2024**, highlighting its multidisciplinary strength.

Notably, Centrale Nantes was named **the top institution in France in the "Engineering Schools to Change the World"** ranking, compiled by **Les Echos START and ChangeNOW**, which evaluates schools based on their contributions to social and ecological transitions. This ranking showcases its dedication to sustainability and innovative solutions to global challenges.

Centrale Nantes' research extends beyond traditional engineering disciplines. It is recognized for pioneering work in **artificial intelligence** and **robotics**, often ranking among the **top 100 worldwide** in these fields. Its **computational mechanics** and **hydrodynamics** research centers are considered among the best in Europe, further cementing its status as a leader in cutting-edge scientific research.

Through strong global partnerships and innovative initiatives, Centrale Nantes continues to enhance its reputation as a world-class institution in scientific and technological research, with a strong focus on sustainability and impactful solutions for societal challenges. Please take look at our institution before submitting your application: https://www.ec-nantes.fr/

Profile required

Eligibility criteria - Specific Requirements

- **You are a First-stage or an Experienced Researcher** eg. in possession of a doctoral degree at the time of the call deadline (10th Sept 2025) and a maximum of 8 years full-time equivalent experience in research (self-assessment tool here).
- **You comply with the mobility rule**: eg. you must not have resided or carried out your main activity (work, studies, etc.) in France for more than 12 months in the 36 months immediately before the call deadline (September 10th, 2025). All nationalities welcome!
- **You want to carry out an innovative research:** only the best proposals will be selected by the European Commission. All domains of research are eligible!
- **You already have great achievements in research:** Curriculum Vitae is an important criterion of MSCA application.

Conditions of employment

Duration	12 to 24 months
Salary	Around €6 000 (fully loaded cost of employment) per month Exact salary to be published in the MSCA PF call in April 2025.
Support to mobility and family	mobility allowance (€ 710 per month) + family allowance (€ 660 per month) if applicable - both allowances are fully loaded cost of employment
Secondment	An interdisciplinary and/or intersectoral mobility (3 months up to 1/3 of fellowship) is possible **when relevant**
Additional benefits:	- Teleworking possible - 75% transport reimbursement - Sustainable mobility bonus (if cycling or car-pooling)

Selection process

How to apply to MSCA Postdoctoral Fellowship with Centrale Nantes:

Step 1: Find a supervisor at Centrale Nantes (application before March 31st, 2025)

- *Select a pre-determined topic*: You apply **in English** to one or two research subject(s) provided by supervisors (please see table 2 below) :
    - Detailed Curriculum Vitae (including list of publications);
    - A concise statement of research's relevance to the selected topic/duration, along with a detailed proposal outlining your project idea for the MSCA Postdoctoral Fellowship;
    - Link and/or information about your doctoral thesis;
    - Contact information of two references (not mandatory, recommended).

Please apply by sending your application to pauline.rouaud@ec-nantes.fr and yolaine.lebeau@ec-nantes.fr before **March 31st, 2025**. Please always include both contacts so that your request can be processed as quickly as possible.
If your application is retained (feedback at the latest: end of April 2025), then, the next step is to apply jointly to the MSCA PF (call launched by the European Commission - HORIZON-MSCA-2025-PF-01-01).

Step 2: Prepare the application to the MSCA PF

April-May 2025

- You receive an informative MSCA-PF starter package via an online meeting with advice on institutional aspects and horizontal issues (open science, gender, ethics and research data management…) - fellow + supervisors + EU project managers
- You elaborate jointly the research approach with your supervisor(s) (April 2025)

June 2025

- One joint meeting in Nantes. You receive a dedicated training session "Preparing for an Horizon Europe MSCA Postdoctoral Fellowship" advice on how to write your proposal - fellow + supervisors + EU project managers

July-August 2025

- Online meeting for proofreading - fellow + supervisors + EU project managers

September 2025

- Online meeting for administrative support for your MSCA PF application - fellow + supervisors + EU project managers
- We apply for you (deadline for the application: September 10th, 2025)

Please read this page to understand how MSCA PF works: https://marie-sklodowska-curie-actions.ec.europa.eu/actions/postdoctoral-fellowships/6-steps-to-prepare-your-application

Centrale Nantes is committed to equality and diversity. In line with our CSR commitments, this call is open to all.