



Offer #2024-07119

## Post-Doctoral Research Visit F/M Deep generative approaches for personalized training in virtual reality

**Contract type :** Fixed-term contract

**Level of qualifications required :** PhD or equivalent

**Fonction :** Post-Doctoral Research Visit

### Context

This postdoc is situated in the context of ANR CREATTIVE3D, a French state-funded project that deploys virtual reality headsets (VR) to study navigation behaviors in complex environments, and the impact of low-vision conditions. It involves partners in computer science and neuroscience from the Université Côte d'Azur (I3S, CHU Nice, LAMHÉSS) as well as the LPC lab of Aix-Marseille Université. The postdoc project will be entirely carried out in the Biovision team of Inria Center at Université Côte d'Azur.

### Assignment

**Context:** When using virtual reality for real-life applications such as rehabilitation and training, cognitive and behavioral measures are put in place to better understand the user experience and evaluate the effectiveness of these applications. Questionnaires are a popular tool to measure the sense of presence [Sla99], emotion [BBC04], and broader user experience components including immersion and engagement [TLC16], which have been notably adopted by Jicol et al. [JWD21] to investigate the interplay between agency, presence, and emotion with the use of structural equation models. Our recent work combining the use of physiological sensors and gaze tracking [GRB22] investigated correlations between attention, emotion, and content saliency when viewing 360 videos in VR.

The project has completed a large-scale study of walking in VR with simulated low-vision conditions with multimodal data collection (gaze, motion, and physiology), resulting in open dataset, software, and AI modeling baselines [RWS23,WRG24,GWS24]. We are currently in the phase of re-iterating the study in a clinical setting at the Institut Claude Pompidou, Nice, with patients of low vision and other neuro-degenerative conditions.

**Assignment:** In line with the clinical studies, the postdoc will integrate into a multi-disciplinary team to investigate AI approaches for personalized training protocols in VR adapted to each patient's needs. Specifically, the research the postdoc will tackle involves:

1. What is the impact of low vision and neuro-degenerative conditions on 6 degrees of freedom navigation in VR? We tackle this question through AI modelling of clinical data on tasks such as classification of disease markers, and multimodal prediction on gaze and physiological responses.
2. State of the art and initial investigation into generative AI approaches for 3D training scenario generation, personalized to user profiles, specifically for use in clinical settings.

### References :

ANR CREATTIVE3D project site: <https://project.inria.fr/creattive3d/>

Biovision team website: <https://team.inria.fr/biovision/>

[BBC04] Baños, R. M., Botella, C., Alcañiz, M., Liaño, V., Guerrero, B., & Rey, B. (2004). Immersion and emotion: their impact on the sense of presence. *Cyberpsychology & behavior*, 7(6), 734-741.

[GRB22] Guimard, Q., Robert, F., Bauge, C., Ducreux, A., Sassatelli, L., Wu, H. Y., ... & Gros, A. (2022, June). PEM360: A dataset of 360° videos with continuous Physiological measurements, subjective Emotional ratings and Motion traces. In *Proceedings of the 13th ACM Multimedia Systems Conference* (pp. 252-258).

[GWS24] Franz Franco Gallo, Hui-Yin Wu, Lucile Sassatelli. Human Trajectory Forecasting in 3D Environments: Navigating Complexity under Low Vision. 2024 ACM Multimedia Systems Workshop on IMmersive Mixed and Virtual Environment Systems (MMVE), Apr 2024, Bari, Italy. pp.57-63,

[JWD21] Jicol, C., Wan, C. H., Doling, B., Illingworth, C. H., Yoon, J., Headey, C., ... & O'Neill, E. (2021, May). Effects of emotion and agency on presence in virtual reality. In *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems* (pp. 1-13).

[Sla99] Slater, M. (1999). Measuring presence: A response to the Witmer and Singer presence questionnaire. *Presence: teleoperators and virtual environments*, 8(5), 560-565.

[TLC16] Tcha-Tokey, K., Loup-Escande, E., Christmann, O., & Richir, S. (2016, March). A questionnaire to measure the user experience in immersive virtual environments. In *Proceedings of the 2016 virtual reality international conference* (pp. 1-5).

[RWS23] Robert, F., Wu, H. Y., Sassatelli, L., Ramanoel, S., Gros, A., & Winckler, M. (2023, June). An integrated framework for understanding multimodal embodied experiences in interactive virtual reality. In *Proceedings of the 2023 ACM International Conference on Interactive Media Experiences* (pp. 14-26).

[WRG24] Wu, H. Y., Robert, F. A. S., Gallo, F. F., Pirkovets, K., Quere, C., Delachambre, J., ... & Kornprobst, P. (2023). Exploring, walking, and interacting in virtual reality with simulated low vision: a living contextual dataset.

## Main activities

### Main activities :

- Proposing, implementing, and evaluating methods for multimodal data modeling from the clinical study
- Conducting an in-depth state of the art and establishing baselines of generative AI for 3D content targeted for clinical rehabilitation/training
- Participating and presenting at regular research meetings with partners, as well as relevant scientific and outreach seminars
- Publishing research results through scientific journals and conferences

### Additional activities :

- Research-related teaching activities such as supervising master student projects

## Skills

**Technical skills and level required :** We expect a good level of programming in Python and at least one other language of choice with which you would be comfortable:

- implementing well-know algorithms (e.g., search and sort) and data structures (e.g., lists, trees, graphs)
- importing, exporting, and processing files containing data (e.g., json, csv) or other content (e.g., text, image)
- describing the common libraries used for your domain of expertise

**Languages :** a good level of English reading, writing, and speaking is required. By good, we expect previous examples of written documentation and scientific papers in English.

**Relational skills :** Regular communication of progress, results, and difficulties is absolutely necessary

## Benefits package

- Subsidized meals
- Partial reimbursement of public transport costs
- Leave: 7 weeks of annual leave + 10 extra days off due to RTT (statutory reduction in working hours) + possibility of exceptional leave (sick children, moving home, etc.)
- Possibility of teleworking (after 6 months of employment) and flexible organization of working hours
- Professional equipment available (videoconferencing, loan of computer equipment, etc.)
- Social, cultural and sports events and activities
- Access to vocational training
- Social security coverage

## General Information

- **Theme/Domain :** Data and Knowledge Representation and Processing Scientific computing (BAP E)
- **Town/city :** Sophia Antipolis
- **Inria Center :** [Centre Inria d'Université Côte d'Azur](#)
- **Starting date :** 2024-10-01
- **Duration of contract :** 1 year, 6 months
- **Deadline to apply :** 2024-06-16

## Contacts

- **Inria Team :** [BIOVISION](#)
- **Recruiter :**  
Wu Hui-yin / [hui-yin.wu@inria.fr](mailto:hui-yin.wu@inria.fr)

## About Inria

Inria is the French national research institute dedicated to digital science and technology. It employs 2,600 people. Its 200 agile project teams, generally run jointly with academic partners, include more than 3,500 scientists and engineers working to meet the challenges of digital technology, often at the interface with other disciplines. The Institute also employs numerous talents in over forty different professions. 900 research support staff contribute to the preparation and development of scientific and entrepreneurial projects that have a worldwide impact.

## The keys to success

- **Domain knowledge and motivation:** we seek candidates with strong competences in modern deep learning paradigms, tools, and libraries, and strong interest in cognitive science or neuroscience. We particularly appreciate any knowledge, coursework, and prior projects in visual perception, action, and/or emotion.
- **Willingness to learn:** this is a multidisciplinary project, and you will likely be learning about a whole new domain of knowledge (generative AI, cognitive science, and/or virtual 3D environments)
- **Proactiveness:** you will be joining the project in the middle of its term, with multiple branches of activities going on, some of which you will be participating in and/or continuing. Actively asking questions and participating in activities of the research team will help you better identify the scope of your postdoc project.
- **Adaptability:** Research involves uncertainty. Technologies and approaches nowadays are evolving at unprecedented speeds, notably in AI. You will need to stay up to date with current advances in the field, and be willing to adapt the research project direction.
- **Rigor:** This project involves interactions in a clinical setting as well as clinical data. Strict observation of ethical protocols for data processing, analysis, and storage are absolutely necessary.

All applications must include:

- CV with education, experience, and publications
- A motivation letter **detailing your profile in relation to this post and your long-term career plans**
- A writing sample (publication or report)
- A recommendation letter is appreciated but not required

**Warning :** you must enter your e-mail address in order to save your application to Inria. Applications must be submitted online on the Inria website. Processing of applications sent from other channels is not guaranteed.

## Instruction to apply

### Defence Security :

This position is likely to be situated in a restricted area (ZRR), as defined in Decree No. 2011-1425 relating to the protection of national scientific and technical potential (PPST). Authorisation to enter an area is granted by the director of the unit, following a favourable Ministerial decision, as defined in the decree of 3 July 2012 relating to the PPST. An unfavourable Ministerial decision in respect of a position situated in a ZRR would result in the cancellation of the appointment.

### Recruitment Policy :

As part of its diversity policy, all Inria positions are accessible to people with disabilities.