



**Offer #2022-05154**

## **PhD Position F/M Video-based dynamic garment representation and synthesis**

**Contract type :** Fixed-term contract

**Level of qualifications required :** Graduate degree or equivalent

**Fonction :** PhD Position

### **About the research centre or Inria department**

The Inria Grenoble - Rhône-Alpes research center groups together almost 600 people in 22 research teams and 7 research support departments.

Staff is present on three campuses in Grenoble, in close collaboration with other research and higher education institutions (University Grenoble Alpes, CNRS, CEA, INRAE, ...), but also with key economic players in the area.

Inria Grenoble - Rhône-Alpes is active in the fields of high-performance computing, verification and embedded systems, modeling of the environment at multiple levels, and data science and artificial intelligence. The center is a top-level scientific institute with an extensive network of international collaborations in Europe and the rest of the world.

### **Context**

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The Ph.D. position is part of a joint laboratory between Interdigital, a leading technology and research company, and Inria, the French national institute of computer science and automation. In particular, the Ph.D. is shared between an Interdigital team in Rennes, Inria Morpheo team in Grenoble, and Inria Mimetic team in Rennes.

#### **About**

The Ph.Ds. will start in **October 2022** and their duration will be 3 years. The Ph.D. will be supervised by [Pierre Héllier](#) (Interdigital Rennes), [Bharath Damodaran](#) (Interdigital Rennes), [Adnane Boukhayma](#) (Inria Rennes), and [Stefanie Wuhrer](#) (Inria Grenoble).

#### **Location**

The Ph.D. will take place at Inria Grenoble with planned regular research visits in Rennes.

### **Assignment**

It has recently become possible to reconstruct sequences of temporally coherent 3D models of humans in clothing from input videos, which subsequently allows to synthesize new animations, e.g. [1,2]. Such state-of-the-art approaches typically learn a model of clothing on top of a parametric body model and are hence limited to relatively tight clothing. Our prior work allows modeling more diverse clothing using a fuzzy correspondence of the garments and the underlying parametric body, at the cost of losing fine-scale geometric detail in the model [3]. An orthogonal line of works models clothing using garment templates, and learns the garment's dynamic behavior during deformation of the person wearing the garment e.g. [4]. This strategy allows modeling detailed complex wide and multi-layered garments, and can be used to synthesize realistic dynamic videos [5].

This Ph.D. is concerned with learning efficient garment representations from a given input video. In particular, the work will focus on two aspects. First, we will study how to combine advantages of existing lines of work to learn a garment representation that allows for wide and multi-layered clothing without the need for a detailed garment template at inference time. The resulting representation should generalize to a large set of different garment styles and materials, and may hence benefit from physics-inspired models such as [4,6]. The temporal consistency would also benefit from the estimation of dense correspondences between clothed body parts, as proposed recently in [7]. Second, we will use the resulting representation to synthesize new animations and eventually change the appearance of the garments. A possible aspect to consider for synthesis and transmission of these models over the network is the sparsity of the models, or the compression capability of the extracted latent representation. Evaluating these animations is not straight forward and different evaluation metrics will be considered

for this task.

References:

1. Dynamic Surface Function Networks for Clothed Human Bodies. Burov, Niessner, Thiess. International Conference on Computer Vision, 2021.
2. ICON: Implicit Clothed humans Obtained from Normals. Xiu, Yang, Tzionas, Black. CVPR, 2022 (<https://icon.is.tue.mpg.de/>).
3. Analyzing Clothing Layer Deformation Statistics of 3D Human Motions. Yang, Franco, Hétroy-Wheeler, Wuhler. European Conference on Computer Vision, 2018.
4. Self-supervised neural dynamic garments. Santesteban, Otaduy, Casas. Conference on Computer Vision and Pattern Recognition, 2022.
5. Dynamic Neural Garments. Zhang, Ceylan, Wang, Mitra. SIGGRAPH Asia 2021.
6. Learning-based cloth material recovery from video. Yang, Liang, Lin. Conference on Computer Vision and Pattern Recognition, 2017.
7. BodyMap: Learning Full-Body Dense Correspondence Map. A. Ianina et al., CVPR 2022 (<https://nsarafianos.github.io/bodymap>).

The full job offer is available [here](#).

## Main activities

See "Assignments".

Important information concerning the COVID-19 epidemic: in case the rules by the French government and Inria related to the epidemic make it impossible for the candidate to physically start the position at Inria Grenoble, the position will start with teleworking.

## Skills

Candidate profile

- Master in Computer Science or Applied Mathematics.
- Solid programming skills, e.g. python and/or C++.
- Solid mathematical knowledge in geometry, linear algebra and statistics.
- Experience with deep learning and shape modeling is a plus.
- Experience with physics-based simulation is a plus.
- Good English level. French is not required.

## 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 (90 days / year) 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 under conditions

## Remuneration

1st and 2nd year: 1 982 euros gross salary /month

3rd year: 2 085 euros gross salary / month

## General Information

- **Theme/Domain** : Vision, perception and multimedia interpretation
- **Town/city** : Montbonnot
- **Inria Center** : [Centre Inria de l'Université Grenoble Alpes](#)
- **Starting date** : 2022-10-01
- **Duration of contract** : 3 years
- **Deadline to apply** : 2022-10-30

## Contacts

- **Inria Team** : [MORPHEO](#)
- **PhD Supervisor** :  
Wuhler Stefanie / [stefanie.wuhler@inria.fr](mailto:stefanie.wuhler@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

Only complete applications will be considered. Please send:

- CV
- motivation letter
- your grades (Bachelor and Master studies)
- the name and contact information of 2 people willing to provide a reference for you (Master's supervisor or Prof. for instance)

**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

Applications must be submitted online on the Inria website.  
Processing of applications sent by other channels is not guaranteed.

### **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.