Offer #2020-03154

Combining implicit and explicit surface representations for 3D human reconstruction from a single image

Contract type : Internship

Level of qualifications required : Graduate degree or equivalent

Fonction : Internship Research

Level of experience : Recently graduated

About the research centre or Inria department

The Inria Rennes - Bretagne Atlantique Centre is one of Inria's eight centres and has more than thirty research teams. The Inria Center is a major and recognized player in the field of digital sciences. It is at the heart of a rich R&D and innovation ecosystem: highly innovative PMEs, large industrial groups, competitiveness clusters, research and higher education players, laboratories of excellence, technological research institute, etc.

Assignment

Keywords: Human 3D reconstruction, parametric shape models, implicit surface representation.
Research fields: Deep learning, 3D computer vision.

3D reconstruction of humans is a popular problem in computer vision and graphics. While earlier successful methods in the field relied on triangulation from multiple cameras or depth sensors for estimating the 3D, learning based approaches have recently allowed to lower the acquisition constraints. Nowadays, many deep learning based methods can recover 3D models of humans from a single color image, by learning strong statistical priors from substantial amounts of training data.

A family of these works use parametric shape models [1,2] and/or explicit surfaces [3,4] to represent the underlying naked human body. They tend to generalize well to images in the wild and they mostly only require weak supervision in training in the form of body joint locations. Another line of work represents the clothed human model with a learnable implicit function [5,6,7]. These latter methods allow to recover detailed surfaces at higher resolutions and can encode varying typologies of clothing. However, they require full 3D ground-truth models for training supervision and do not generalize as well in the wild.

The goal of this internship is to research these surface representations and combine them to allow the best of both worlds for the task of 3D human reconstruction from a single image within a deep learning framework.

References:
[1] Learning to Reconstruct 3D Human Pose and Shape via Model-fitting in the Loop, Kolotouros et al., ICCV 2019
[2] VIBE: Video Inference for Human Body Pose and Shape Estimation, Kocabas et al., CVPR 2020
[3] I2L-MeshNet: Image-to-Lixel Prediction Network for Accurate 3D Human Pose and Mesh Estimation from a Single RGB Image, Moon et al., ECCV 2020
[4] 3D Human Mesh Regression with Dense Correspondence, Zeng et al., CVPR 2020
[5] PIFu: Pixel-Aligned Implicit Function for High-Resolution Clothed Human Digitization, Saito et al., ICCV 2019.
[6] Monocular Real-Time Volumetric Performance Capture, Li et al, ECCV 2020
[7] ARCH: Animatable Reconstruction of Clothed Humans, Huang et la., CVPR 2020

Main activities

- Participating in the research discussions and algorithm design.
- Reading and implementing research papers.
- Reproducing state-of-the-art results.
- Implementing the ideas proposed by the research collaborators.
- Creating training and testing datasets.
- Participating in the publication of the research results.

Skills

Candidates should be preparing a MSc or equivalent degree in computer science, applied mathematics, computer vision, computer graphics or machine learning. Proficiency in coding in Python / Pytorch is a plus.

Benefits package

- Subsidized meals
- Partial reimbursement of public transport costs

Remuneration

Remuneration according to the current hourly rate

General Information

- **Theme/Domain** : Vision, perception and multimedia interpretation
  Scientific computing (BAP E)
- **Town/city** : Rennes
- **Inria Center** : [Centre Inria de l'Université de Rennes](#)
- **Starting date** : 2021-03-01
- **Duration of contract** : 6 months
- **Deadline to apply** : 2021-03-31

Contacts

- **Inria Team** : [MIMETIC](#)
- **Recruiter** :
  Boukhayma Adnane / adnane.boukhayma@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

We are looking for excellent candidates, preferably with a good background in mathematics or computer science, passionate for research and innovation, who can work independently and who are also keen to collaborate with other students and researchers.

> **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

Please submit online : your resume, cover letter and letters of recommendation eventually

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.