2022-05275 - PhD Position F/M Self-supervised learning for implicit shape reconstruction

Type de contrat : CDD  
Niveau de diplôme exigé : Bac + 5 ou équivalent  
Autre diplôme apprécié : MSc or equivalent degree in computer science, applied mathematics, computer vision, computer graphics or machine learning.  
Fonction : Doctorant

A propos du centre ou de la direction fonctionnelle

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.

Mission confiée

Recent years have seen a surge in implicit neural shape representations for modeling 3D objects and scenes within deep learning frameworks. Thanks to their ability to continuously represent detailed shapes with arbitrary topologies in a memory-efficient way, these representations alleviate many of the shortcomings of the traditional alternatives such as polygon meshes, point clouds and voxel grids. In practice, these shape functions are typically multi-layer perceptrons mapping 3D points to occupancy or signed distance values. The zero level set of the inferred field can be rendered differentiably through variants of ray marching and tessellated into explicit meshes with Marching Cubes. Coupling these implicit neural functions with conditioning mechanisms allows generalization across multiple shapes. For instance, combining their inputs with local features generated from additional encoding networks [1,2,3,4] yields single forward pass inference models that can learn 3D reconstruction from various input modalities such as images [5,6] or partial point clouds [1,2,3,4]. These models are commonly trained using dense points sampled near the ground-truth surface. Hence, training them to perform reconstruction from images or point clouds requires typically substantial full 3D supervision that is hard to acquire. With the prospect of alleviating this expensive data dependence, we will explore in this project the extension of self-supervised methods to 3D implicit reconstruction. Existing self-supervised learning techniques in vision focus mostly on holistic 2D recognition tasks [7,8]. Our goal is to design self-supervised learning mechanisms that can reason locally [9] and benefit from inductive biases in 3D euclidean space. As a primary application, we are interested in developing self-supervised deep learning based methods that can create accurate digital 3D replicas of people [10,11] from minimal input such as a single color image or sparse depth map, monocular color or depth videos, captured with a consumer grade camera. This research will contribute to the democratization of 3D people scanning and telepresence, among other human centered applications.

3] “POCO: Point Convolution for Surface Reconstruction.” CVPR 2022  

Principales activités

Informations générales

- Thème/Domaine : Vision, perception et interprétation multimedia  
- Ville : Rennes  
- Centre Inria : Centre Inria de l’Université de Rennes  
- Date de prise de fonction souhaitée : 2022-12-01  
- Durée de contrat : 3 ans  
- Date limite pour postuler : 2023-09-30

Contacts

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A propos d’Inria

Inria est l’institut national de recherche dédié aux sciences et technologies du numérique. Il emploie 2600 personnes. Ses 200 équipes-projets agiles, en général communes avec des partenaires académiques, impliquent plus de 3500 scientifiques pour relever les défis du numérique, souvent à l’interface d’autres disciplines. L’institut appelle à de nombreux talents dans plus d’une quarantaine de métiers différents. 900 personnels d’appui à la recherche et à l’innovation contribuent à faire émerger et grandir des projets scientifiques ou entrepreneuriaux qui impactent le monde. Inria travaille avec de nombreuses entreprises et a accompagné la création de plus de 180 start-up. L’institut s’efforce ainsi de répondre aux enjeux de la transformation numérique de la science, de la société et de l’économie.

L’essentiel pour réussir

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.
The PhD student will be tasked with:

- Examining the state of the art of implicit shape reconstruction and self-supervised learning.
- Contributing new self-supervised deep implicit models for 3D reconstruction from images and point clouds.
- Achieving generalization to images, videos and point clouds of clothed people.

**Compétences**
Candidates should preferably have a MSc or equivalent degree in computer science, applied mathematics, computer vision, computer graphics or machine learning. Proficiency in coding in Python and C++ is a plus.

**Avantages**
- Subsidized meals
- Partial reimbursement of public transport costs
- Possibility of teleworking (90 days per year) and flexible organization of working hours
- Partial payment of insurance costs

**Rémunération**
Monthly gross salary amounting to 2051 euros for the first and second years and 2158 euros for the third year

**Consignes pour postuler**
Please submit online: your resume, cover letter and letters of recommendation eventually

**Sécurité défense**:
Ce poste est susceptible d'être affecté dans une zone à régime restrictif (ZRR), telle que définie dans le décret n°2011-1425 relatif à la protection du potentiel scientifique et technique de la nation (PPST). L'autorisation d'accès à une zone est délivrée par le chef d'établissement, après avis ministériel favorable, tel que défini dans l'arrêté du 03 juillet 2012, relatif à la PPST. Un avis ministériel défavorable pour un poste affecté dans une ZRR aurait pour conséquence l'annulation du recrutement.

**Politique de recrutement**:
Dans le cadre de sa politique diversité, tous les postes Inria sont accessibles aux personnes en situation de handicap.