

1 PhD position available within the EUTOPIA Co-tutelle (double PhD degree) Program 2022 on Deep learning for human pose estimation in videos (DeepPOSE)

21 Juillet 2022

Catégorie : Doctorant

Home Institution: *CY Cergy Paris Université - Équipe Traitement de l'Information et Systèmes (ETIS).*

Host Institution: *Vrije Universiteit Brussel, Electronics & Informatics Dept. (ETRO).*

Supervisors: *Prof. Aymeric Histace (aymeric.histace@ensea.fr), Prof. Hichem Sahli (hsahli@etrovub.be), Prof. Bart Jansen (bjansen@etrovub.be), Dr. Xuan Son Nguyen (xuan-son.nguyen@ensea.fr).*

Starting date: *September/October/November 2022.*

Duration: *4 years.*

Keyword: *Graph neural networks, human pose estimation, geometric deep learning, manifold learning.*

Description

Human pose estimation has always been an active research domain in computer vision. Early solutions to this problem are based heavily on classical machine learning. Thanks to the extensive development of recent deep learning methods that revolutionize many domains in computer vision and the availability of large-scale datasets of human pose, many issues in human pose estimation have been addressed. In many real-world applications, however, existing human pose estimation methods are not mature enough to build trustworthy AI that can replace humans. Some examples are movement assessment, analysis of injuries, and action recognition in sports, to name a few. These applications require real-time, highly accurate human pose estimation techniques that are able to deal with fast movements, unusual poses, self-occlusion, etc. Recently, Graph Convolutional Networks (GCNs) [1, 2, 3, 4, 5] have increasingly attracted attention in the machine learning community and these models have demonstrated state-of-the-art performance in many machine learning tasks. GCNs generalize many concepts of Convolutional Neural Networks to deal with graph data. Although a variety of GCNs has been proposed to address 3D human pose classification, their application in 3D human pose estimation is currently underexploited. GCNs are particularly well suited for analysing human pose data since they can capture complex dependencies of human joints during an action where the human skeleton can be naturally represented by a graph.

Your research will focus on developing GCN-based learning algorithms for (a) 3D human pose estimation from monocular videos, (b) Physical aware 3D sport gesture recognition and analysis.

Offer

We offer a co-tutelle PhD position for 4 years, in an inspiring, challenging, and flexible research environment. The candidate will jointly be enrolled at CY Cergy Paris Université and the Vrije Universiteit Brussel. CY Cergy Paris Université will be the main institution where the student will work 4 years, and two research visits of 6 months are foreseen at the

ETRO Dept. of the Vrije Universiteit. The candidate will be jointly supervised by academic staff at each institution, and, upon successful completion of the PhD programme, the candidate will graduate with a PhD title from each university. The candidate will receive a scholarship of 1975 € per month (before income tax).

Research Environment

You will be hired at CY Cergy Paris Université with frequent visits to the Vrije Universiteit Brussel

- CY Cergy Paris Université - Équipe Traitement de l'Information et Systèmes (ETIS) : The student will be located at École Nationale Supérieure de l'Électronique et de ses Applications (ENSEA), a public institution of excellence. ENSEA is involved in numerous research projects in collaboration with both academic and industrial partners. The location is about 30 km from Paris, gateway to Europe.
- Vrije Universiteit Brussel, Electronics & Informatics Dept. (ETRO - <http://www.etrovub.be/>): ETRO offers an international scientific environment driven by excellence in fundamental research. The main research areas relevant for this position are Machine learning and signal processing, focusing on theory and architectures for behavior analysis and rehabilitation engineering.

Profile and requirements

The successful candidate must have a strong interest in working in an international environment. The successful candidate should have completed a Master degree (or equivalent) in computer science, engineering, applied or computational mathematics, or a closely related field. The candidate should have strong background in applied mathematics, computer vision and machine learning with good programming (Python) skills. Basic knowledge of graphs may be useful but not required. Experience in deep learning frameworks such as Pytorch/Tensorflow will be appreciated. Finally, good communication and written skills in English are required.

How to apply

Interested candidates should send:

- a detailed curriculum vitae,
- a motivation letter related to the position's profile,
- grades obtained in MSc or engineering school
- the names of two potential referees

to the following contact persons: Prof. Aymeric Histace (aymeric.histace@ensea.fr), Prof. Hichem Sahli (hsahli@etrovub.be), Dr. Xuan Son Nguyen (xuan-son.nguyen@ensea.fr), Prof. Bart Jansen (bjansen@etrovub.be).

References

- [1] Ke Cheng, Yifan Zhang, Xiangyu He, Weihang Chen, Jian Cheng, and Hanqing Lu. Skeleton-Based Action Recognition With Shift Graph Convolutional Network. In CVPR, pages 180-189, 2020.
- [2] Michael Defferrard, Xavier Bresson, and Pierre Vandergheynst. Convolutional Neural Networks on Graphs with Fast Localized Spectral Filtering. In NIPS, pages 3844-3852, 2016.
- [3] Martin Simonovsky and Nikos Komodakis. Dynamic Edge-Conditioned Filters in Convolutional Neural Networks on Graphs. CoRR, abs/1704.02901, 2017.
- [4] Sijie Yan, Yuanjun Xiong, and Dahua Lin. Spatial Temporal Graph Convolutional Networks for Skeleton-Based Action Recognition. In AAAI, pages 7444-7452, 2018.

[5] Xikun Zhang, Chang Xu, Xinmei Tian, and Dacheng Tao. Graph Edge Convolutional Neural Networks for Skeleton Based Action Recognition. CoRR, abs/1805.06184, 2018.