PhD Position: Human gestural analysis based on fine-grained motion and graph convolutional networks

IMT Nord Europe
École Mines-Télécom
IMT-Université de Lille

1 - Context and funding

The Centre for Education, Research and Innovation (CERI) Digital Systems covers a wide disciplinary field linked to constrained systems (the Internet of Objects, robotics), Humans (and in particular their interactions with the digital world) or even complex systems through the prism of Artificial Intelligence and Automation. The thesis will be conducted within the HIDE group. The aim of this group is to develop models and methods for digital simulation, machine learning or even decision making to help humans reason better, improve their interaction with their environment and better optimise certain processes.

A co-funding of 50% from the Région Hauts-de-France.

2 - Research project

The aim of this thesis is to develop systems based on fine-grained motion analysis (using cameras and/or non-intrusive sensors) and graphical convolutional networks (GCN), allowing to accurately detect the gesture of a person in a video stream. The objective of this thesis is to propose a robust and easily adaptable mathematical tool to encode, at different levels of granularity, the movement of an individual, based on the physical constraints induced by the human body (skeleton, muscle). In addition to gesture detection, attention will be paid to motion filtering and temporal segmentation of motion activation so that the system can be easily deployed in a less controlled acquisition context. This work can be applied to different applications, such as home care, medical diagnosis and rehabilitation after an accident, or augmented reality/virtual reality interaction.

3 -Team supervision and PhD registration

Advisor: Hazem Wannous, Professor, IMT Nord Europe
Co-advisor: Benjamin Allaert, Associate Professor, IMT Nord Europe

4 - Candidate profile

Qualification: The candidate is expected to have an MSc degree in Computer Science or closely related discipline.

Experience: The ideal candidate should have some knowledge and experience in Computer vision and in Machine and Deep learning. As for generic competences, we seek a qualified professional, with a teaching vocation, empathy, capacity for teamwork, motivation for innovation, capacity to adapt and to identify with UD's identity and mission.

Language Skills: Fluent written and verbal communication skills in English are required.

5 - How to apply

Please send: CV + grades + copy of degrees + motivation letter to Hazem Wannous, hazem.wannous@imt-nord-europe.fr and Benjamin Allaert, benjamin.allaert@imt-nord-europe.fr

6 – References

Heidari, N., & Iosifidis, A. (2021, January). Temporal attention-augmented graph convolutional network for efficient skeleton-based human action recognition. In *2020 25th International Conference on Pattern Recognition (ICPR)* (pp. 7907-7914). IEEE.
Xu, W., Wu, M., Zhu, J., & Zhao, M. (2021). Multi-scale skeleton adaptive weighted GCN for skeleton-based human action recognition in IoT. *Applied Soft Computing*, *104*, 107236.