Master internship subject

Generative Models for Garment Mesh

Hosting institute

ICube Laboratory (The Engineering science, computer science and imaging laboratory) at the University of Strasbourg is a leading research center in Computer Science, with more than 300 permanent researchers, with the recently opened AI graduate school supported by the French government.

Work place and salary

The thesis work will take place in the MLMS (Machine Learning, Modeling & Simulation) research team of the ICube laboratory (The Engineering science, computer science and imaging laboratory) of the University of Strasbourg, a leading research center with more than 300 permanent researchers. The workplace is located on the hospital site of the laboratory, a 10-minute walk from the heart of downtown Strasbourg, listed as a UNESCO World Heritage Site.

650 euros net monthly

Supervisors

– director: Hyewon Seo (ICube, Univ. Strasbourg)

– co-supervisors: Cédric Bobenrieth (ICAM, Strasbourg)

Staring date

January 2025 – March 2025.

Description

Geometric deep learning has emerged in the fields of computer graphics and computer vision, enabling deep learning models to operate on geometric data such as graphs, meshes, manifolds, and point clouds. Some notable models in this area include Graph Convolutional Networks (GCNs), PointNet, Geodesic Neural Networks (GNNs), and specialized architectures for 3D meshes, such as MeshNet and MeshCNN.

Motivated by these recent successes, we will explore and develop geometric deep learning models for a 3D mesh dataset. In particular, we are interested in 3D garment mesh data representing garment shapes in motion. Our specific focus will be on generative models capable of performing various downstream tasks, such as sequence inpainting and conditional generation.

We will proceed with the following tasks:

1. **Shape representation:** The first step is to investigate how to represent various mesh data in a uniform manner, irrespective of its topological structure. While the representation should be invariant to rigid transformations and vertex/triangle orders, it must also be sensitive to geometric characteristics in order to effectively encode shape changes during motion.
2. **Unconditional generation:** We will deploy a Transformer or diffusion model for the temporal encoding of garment meshes in motion. A semi-supervised approach will be developed by incorporating loss terms that ensure physical faithfulness of the 3D mesh.

3. **Conditional generation**: The developed generator will be extended to support conditional generation. Class labels, partial sequence, or the canonical forms of the targeted garment mesh are considered as conditional signals.

Candidate profile

− Master degree in Computer Science, Electronic & Electrical Engineering, or in Applied Mathematics

− Solid programming skills: Python/C++

− Background in Geometric Modeling

− Experience in Deep Learning

− Good communication skills

Application

Send your CV and academic records (Bachelor and Master) to seo@unistra.fr, for (a) possible interview(s).