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Département ITI – Laboratoire LATIM

Soutiendra publiquement ses travaux en vue de l'obtention du grade de

Docteur d'IMT Atlantique

Dans le cadre de la co-accréditation de thèse d'IMT Atlantique au sein de l'école doctorale Mathstic

En co-tutelle avec University of Cape Town

Le 18/03/2021 à 16h00 en visio-conférence totale

(disposition exceptionnelle durant la crise sanitaire liée à la Covid-19)

Towards a framework for multi class statistical modelling of shape, intensity, and kinematics in medical images

Abstract : This thesis focuses on the development of statistical learning-based models for human joints from medical images. The main contribution is a new mathematical formulation to model musculoskeletal systems by developing a unified computational latent space that embeds shape, kinematics and intensity features from given observations. This new space provides a continuous model capable of generating instances leveraging learnt feature correlations. A fitting method to apply models developed using this framework to unseen data is also proposed. The complete modeling and prediction framework is validated using bespoke synthetic data, showing that the framework faithfully encapsulates any prescribed morpho-functional relationships between objects, as well as their internal structural information. Finally, the framework is applied to the analysis of shoulder and hip joints from CT. The clinical interest is that the feature correlations learned by the model improve premorbid shape prediction and joint motion estimation accuracy, from two- and three-dimensional medical.

Keywords: Shape, pose and intensity latent space, shoulder and hip human joint, medical image analysis, pattern recognition

Le jury est composé de :

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| - Mme Valérie BURDIN | - Professeur | - IMT Atlantique |
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Invités :

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| - Mme Tania DOUGLAS | - Full Professor | - University of Cape Town |
| - M. Marcel LÜTHI | - Associate Professor | - University of Basel |