La prochaine session de séminaires des nouvelles chercheuses des laboratoires de la FIL aura lieu le 19 janvier 2023 de 15h à 16h :

Stéphanie Jehan-Besson « Optimization of a shape metric based on

information theory for segmentation evaluation and fusion in 2D or 3D

medical image analysis »

Ce séminaire se déroulera à la fois en présentiel et distanciel.

**Lieu**

INSA Lyon

Amphithéâtre Claude Chappe, département télécommunications

Bâtiment Hedy Lamarr, 6 Av. des Arts, 69100 Villeurbanne

**Lien de visioconférence :**

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- Nom du salon de visioconférence BBB : FIL-seminaires

- Mot de passe : FILNouveauxArrivants

**Animateurs:**

Stefan Duffner, Sébastien Valette

\*Title: \*Optimization of a shape metric based on information theory for

segmentation evaluation and fusion in 2D or 3D medical image analysis

\*Keywords: \*segmentation fusion and evaluation, computation of mean

shapes, information theory, shape gradients, medical image analysis in

2D or 3D

**Abstract:**

In the field of delineation of 2D or 3D complex shapes in medical

imaging, and especially due to the development of multimodal and

multiparametric image acquisition devices, the combination of

segmentation results from different sources is interesting. It is also

essential to accurately assess the variability between delineation

experts or results obtained with different algorithms and different

parameterization. In this work, we propose to estimate what we call a

mutual shape and define it as the optimum of a statistical criterion

based on information theory. This criterion is justified by using the

similarities between the information theory quantities and the area

measures, which leads us to interpret the mutual shape as a shape

metric belonging to the Fréchet family. The information theory

quantities are estimated using probability density functions in a

continuous variational framework. The mutual shape is then computed

using shape optimization tools through the calculation of shape

gradients. We provide synthetic and real examples in 2D or 3D to

demonstrate the applicability of our framework for evaluation and

fusion. These examples allow us to highlight the difference between the

mutual shape and a classical mean shape. We also compare the mutual

shape to the well known STAPLE method and to the minimization of a

simple symmetric difference. We provide experimental results in medical

imaging for the combination and evaluation of segmentation results of

cardiac structures in MRI or echocardiography. Different perspectives

will be mentioned, such as multimodal data fusion in MRI or the

integration of expert variability assessment in deep learning methods.

**Speaker bio:**

After a PhD in the I3S Laboratory on the topic of deformable models

based on shape gradients and domain optimization for image and video

segmentation, Stéphanie Jehan-Besson became an associate professor at

the engineering school of Caen (ENSICAEN). In 2008, she obtained a

permanent position as a CNRS researcher in the field of image and video

processing, first at the LIMOS Laboratory, then at the GREYC Laboratory

in Caen. In 2021, she joined the Curie Institute as a visiting

researcher in the LITO Laboratory (INSERM U1288). In January 2022, she

moved to the CREATIS laboratory as a permanent CNRS researcher in the

MYRIAD team. Her research interests concern the design and optimization

of continuous statistical criteria for various applications

(segmentation of complex structures in 2D or 3D images, motion

estimation and tracking in video sequences, filtering based on total

variation, evaluation or fusion of segmentation methods). While

continuing this work and applications to various medical image

challenges, she is exploring deep learning methods for these

applications.