Research Grants for PhD students from the China Scholarship Council

Information Form (please read the guidelines carefully on the website www-csc.utt.fr)

Supervisor's name : Ainouz   Given names : Samia

Status (prof., assistant prof., …) : Assistant professor

Laboratory : LITIS Lab

Website address : https://www.litislab.fr

Institution : INSA Rouen

Website address : https://www.insa-rouen.fr/

Scientific competence of the supervisor:

Samia Ainouz is expert in computer vision and deep learning. She is head of the STI group of the LITIS Lab

Two major publications in the field proposed for the PhD :

1. A. Adadi and M. Berrada. Peeking inside the black-box: A survey on explainable artificial intelligence (XAI).IEEE Access, 6:52138–52160, 2018.

2. E. Tjoa and C. Guan. A survey on explainable artificial intelligence (WAI): Towards medical XAI.ArXiv, abs/1907.07374, 2019

Website address of the personal page : http://pagesperso.litislab.fr/sainouz/

Supervisor's email : samia.ainouz@insa-rouen.fr

Description of the research work proposed for a PhD   Topic # (see list) : III-7

Title : Explainable Deep Learning for Medical Image Segmentation

Subject :

The semantic segmentation of medical images is an essential milestone in assisting diagnosis and therapy in medicine. Deep convolutional neural networks (CNNs) have made a major breakthrough in computer vision. This change of paradigm has focused almost all research effort in (medical) image segmentation, in particular with architectures allowing the image to be segmented directly, known as end-to-end, such as the popular U-Net.

The high accuracy of deep learning methodology comes at a cost of low interpretability, i.e., the model is seen as a black box that does not provide explanations along with the prediction. This PhD thesis seeks to break this deadlock in order to understand how the networks take its decision, namely by integrating outcomes from explainability process for segmentation network training or design. The PhD candidate will investigate explanation in different forms, such as saliency or sensitivity maps, highlighting the areas that particularly contributed to a decision. Applications investigated within this PhD thesis will be diverse in the medical imagery domain, with tasks such as survival prediction, stage classification, and image segmentation. For the latter, explainability allows to increase the trust of doctors and physicians towards the machine decision, as well as their knowledge on the patterns inside the image and the underlying phenomena.

Keywords :

Medical imagery, deep learning, explainability, image segmentation

Expected collaborations :

Within the PhD thesis, the PhD student will be assisted by Paul Honeine and Caroline Petitjean, both from the LITIS Lab. She/He may also be working with Medical Doctors from the Henri Becquerel Center (the regional anti-cancer center)

The Phd student may take advantage of the ongoing and future international collaborations, mainly with research groups in the Netherlands, the United States and Canada.

Background required from the applicant :

Image processing, pattern recognition, machine learning, deep learning, medical imagery

Existence of a PDF file detailing the proposal ("yes" or "no") : no

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