Job title	**Postdoc Scholarship in deep learning for automatic detection of the myocardial borders on DE-MRI**
Ref	**2018-19-ADVANCES-2**
Job type (PhD, Post-doc, Engineer)	**Post-Doc**
Contract duration (months)	18 months
Qualifications (Master degree, PhD...)	PhD
Job hours (full time/ part time)	Full Time
Employer	UBFC – Université de Franche-Comté
Host Laboratory	Equipe IFTIM, EA ImViA, formerly LE2I
URL Host Laboratory	www.le2i.cnrs.fr
Address Host Laboratory	Equipe IFTIM, Batiment I3M, Campus Montmuzard, Université de Bourgogne, 21000 Dijon
Job description	**Context :** The Post-Doc grant is associated with ISITE-BFC/Industry project called ADVANCES: "Automatic Detection of Viable myocArdiac segmeNts Considering dEep networkS". The abstract of this project, which is managed by Alain Lalande, is below. **Abstract:** One crucial parameter to evaluate the state of the heart after myocardial infarction (MI) is the viability of the myocardial segment, i.e. if the segment can recover functionally upon revascularization. MRI acquired several minutes after injection of a contrast agent (DE-MRI) is a method of choice to evaluate the extent of MI, and by extension, to assess viable tissues after injury (in conjonction with the thickening of the muscle evaluated from cine-MRI). The main objective of the project ADVANCES is to automatically detect the different relevant areas (the myocardial contours, the infarcted area, the permanent microvascular obstruction area, and the border zone of the myocardial infarction) from a series of short-axis DE-MRI covering the left ventricle and then to make a quantification of the MI, in absolute value (mm3) or percentage of the myocardium. The segmentation and quantification methods would be based on deep learning approaches. For that, an existing expertised database (with manual contouring of the different areas on each image) will be enlarged by new examinations from the University Hospital of Dijon in order to be able to train the developed neural networks. Several networks will be designed to produce good segmentations. The border zone that cannot be manually segmented will be processed independently. After validation in a clinical environment of the developed proof of concept, the proposal will be integrated in

a software dedicated to the automatic post-processing of cardiac MRI. This integration will be managed by the CASIS startup, localized in Dijon, which participates in the project. Threefold benefits are expected. First, from medical point of view we will provide a product usable in clinical practice that solves a major issue in cardiac MRI. The improved diagnostic will lead to a better patient healthcare outcome. Second, it will further broaden the use of deep learning for computer-aided diagnostic in medical imaging. Third, it will support the development of a local startup.

Main objective and proposed work during the postdoc:
Automatic detection of the myocardial borders on DE-MRI using deep learning approaches. The objective is to automatically detect the endocardial and epicardial borders on each short-axis image of the series covering the left ventricle, whatever the quality of the images. The segmentation must be as accurate as possible because the total myocardial volume will be obtained from these segmentations. This step is necessary for the detection of disease areas, by limiting the considered area to the myocardium. The postodc will investigate different existing deep architectures that have proven their robustness in segmentation in medical applications. He will also develop his own architecture based on different layers of CNNs and select the most performing one. He will also propose a solution at the slice level (2D) as well as at the volume level (3D) incorporating several slides in the CNN architecture as similarly done for video processing.

Supervisor(s)	Prof Fabrice MERIAUDEAU, fabrice.meriaudeau@u-bourgogne.fr Dr Alain Lalande, alain.lalande@u-bourgogne.fr
Candidate profile	We are looking for a highly motivated candidate with outstanding or excellent PhD's degree or equivalent qualification who is interested to work on deep learning for computer-aided diagnostic in medical imaging. Candidates should have experience with neural networks, more particularly deep networks, and computer programming frameworks for deep learning using Python (Google TensorFlow, PyTorch, or Keras). Knowledge in deep learning approaches for semantic segmentation and medical imaging would also be of advantage. Reasonable proficiency in English (written and spoken) is a requirement. Interpersonal skills, dynamism, rigor and teamwork abilities will be appreciated. Candidates can be fluent either in English and/or in French.
Keywords	Deep Learning, Semantic Segmentation, Medical Imaging, Heart
Application deadline	July 30th, 2018
Starting Job	October 1st, 2018

Application	Please send the following documents (all in one PDF file) by e-mail to job-application@ubfc.fr: 1) For EU candidates: Copy of your national ID card or of your passport page where your photo is printed. For non-EU candidates: Copy of your passport page where your photo is printed. 2) Curriculum Vitae (may include hyperlinks to your ResearchID, Research Gate Google Scholar accounts). 3) Detailed list of publications (may include hyperlinks to DOI of publications). 4) Letter of motivation relatively to the position (Cover Letter) in which applicants describe themselves and their contributions to previous research projects (maximum 2 pages) 5) Copy of your PhD degree if already available. 6) Coordinates of reference persons (maximum 3, at least your master thesis supervisor): Title, Name, organization, e-mail. If you have questions regarding the application, please contact the supervisors.