Master Internship Position

CORRELATION BETWEEN MORPHOLOGY (CT ANGIOGRAPHY) AND FUNCTION (LEFT VENTRICULAR EJECTION FRACTION) USING ARTIFICIAL INTELLIGENCE TECHNIQUES (CARD-IA)

6 months *at* Icube Laboratory and Strasbourg University Hospital, Strasbourg, France

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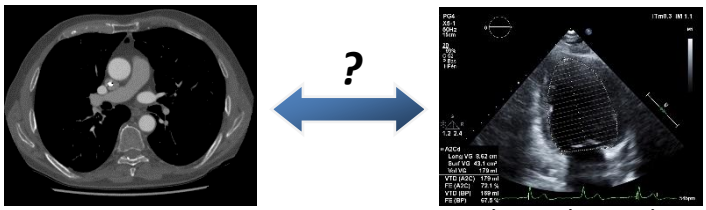
Being able to establish a correlation between the **morphology** – as obtained by a high-resolution chest CT angiography – and the **function** of the heart – as measured using echocardiography, would be extremely useful for radiologists and emergency physicians.



CT Angiography — Echocardiography

MORPHOLOGY — **FUNCTION**

Currently, chest CT angiography provides valuable information regarding the anatomy and the morphology of the heart and mediastinum but cannot deliver functional data (*i.e. it is like a high-resolution still picture*). Echocardiography can visualize heart motion and estimate the contraction of the left ventricle but cannot analyze precise anatomical structures (*i.e. it is like a low-resolution video*).

We hypothesize that Deep Learning based techniques could be used to establish a **correlation** between the anatomical data given by chest CT angiography and the heart function measured by echocardiography.

INTERNSHIP OBJECTIVES

A database consisting of 200+ pairs of chest CT angiography (DICOM data) and Left Ventricular Ejection Fraction measured by echocardiography (discrete value) will be available for this internship. DICOM data will be read by expert radiologists and usual anatomical signs of heart failure will be noted as present of absent.

The objectives of this 6 months internship will be:

a/ first approach of the database using a Machine Learning regression algorithm based on the demographics and the expert reading data (*1 month*);
b/ Testing of various Deep Learning networks and frameworks, validation of technical prerequisites and final choice of the framework (*2 months*);
c/ Optimization of the framework and tweaking of the hyperparameters (*2 months*);
d/ Final testing of the network performances over a validation database (*1 month*).

Funding for a formal scientific presentation at a national meeting (target: *Journées Françaises de Radiologie*) are budgeted and the applicant is strongly encouraged to be the one submitting and presenting.

WORKING ENVIRONMENT

The student will be a member of the IMAGeS team (http://images.icube.unistra.fr/) within the ICube laboratory in Strasbourg, Illkirch.

The internship will begin anytime between January and May 2019, for a total duration of 6 months.

SUPERVISORS

Vincent **Noblet**, PhD, HDR, Ingénieur de Recherche (http://images.icube.unistra.fr/fr/index.php/Vincent_Noblet)

Alex **Lallement**, PhD HDR, Maitre de Conférence (http://images.icube.unistra.fr/fr/index.php/Alex_Lallement)

Mickaël **Ohana**, MD PhD HDR, Radiologue (http://images.icube.unistra.fr/fr/index.php/Mickael_Ohana)

PROFILE OF THE CANDIDATE

— Last year of Master studies in one of the following fields: computer science, applied mathematics, biomedical engineering;

— Good programming skills (the coding language will be Python);

— Interest for medical imaging and biotechnologies;

— An experience with a deep learning framework would be a plus.

APPLICATION

Send a CV and a short motivation letter in French or in English, as well the transcript of marks for the past 2 years, to Mickaël Ohana mickael.ohana@chru-strasbourg.fr