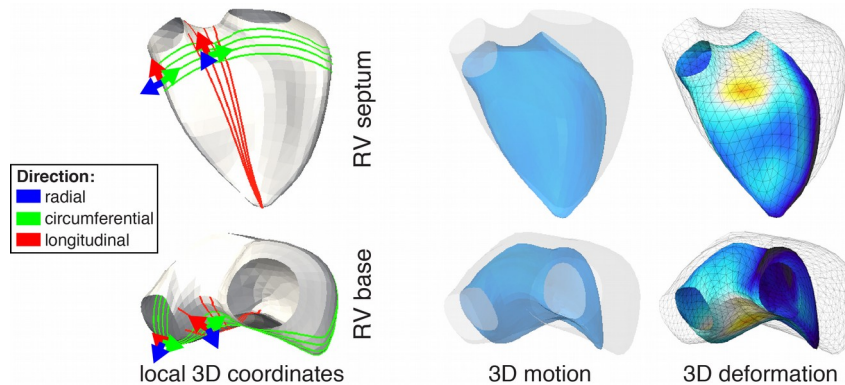


**Title:** 3D quantification of right ventricular shape and deformation from cardiac mesh sequences.  
**Team:** MYRIAD = « Modeling & analysis for medical imaging and Diagnosis »  
**Supervision:** Nicolas DUCHATEAU (Associate Professor / U. Lyon 1), Gabriel BERNARDINO (postdoc fellow).

**Context:** The cardiac right ventricle (RV) is the chamber responsible for pumping blood through the lungs for gas exchange. Compared to the left ventricle (LV), which strokes blood through the full body, the RV works at lower pressures and has thinner walls and an irregular shape. It is positioned surrounding the LV, and is further from the chest, leading to more challenging acquisitions via echocardiography. Despite its importance for disease assessment, it is still understudied due to such complex morphology and more difficult imaging. Clinicians mainly rely on global measurements, such as volume or average strain. Analyzing changes related to disease regionally or locally is highly recommended, but the current quantification tools require proper standardization and reproducibility assessment.



**Objectives:** We have already implemented methods to quantify 3D RV shape or deformation [MOC-18, BER-20], demonstrated on several clinical cohorts. Within the internship, we would like to cover both methodological and applicative aspects :

- Implement and adapt state-of-the-art methods from other authors for the RV quantification [ADD-16, NUN-20, PAN-10],
- Compare the impact of the chosen methods on the regional quantification of 3D RV shape and deformation,
- Evaluate the stability of the quantifications under the noise present in real datasets.

**Practical information:**

- Location: DOUA campus, CREATIS lab, Villeurbanne
- Duration: 5-6 months, starting February-March-April 2021

**Profile:**

- MSc student with applied mathematics and/or computer graphics background
- Good programming skills: Python (preferred), Matlab
- Good English
- Motivated to work on medical applications

**Contact:** Send your CV, motivation letter, and academic record to: [nicolas.duchateau@creatis.insa-lyon.fr](mailto:nicolas.duchateau@creatis.insa-lyon.fr)

**Bibliography:**

- [ADD-16] Addetia et al. Three-dimensional echocardiography-based analysis of right ventricular shape in pulmonary arterial hypertension. *Eur Heart J Cardiovasc Imaging*. 2016;17:564-575.
- [BER-20] Bernardino et al. Handling confounding variables in statistical shape analysis - application to cardiac remodelling. *Med Image Anal*. 2020;65:101792.
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