

Doc. Nr.	: RD7698
Subject	: Internship 'Assessment of valvular regurgitation from x-ray imaging using a machine learning approach'

Pie Medical Imaging designs and delivers software solutions in cardiovascular analysis that drive next-generation research and diagnostics. Backed by an extensive research and development department, Pie Medical Imaging uses its expertise in quantitative analysis software for cardiology and radiology to develop new state-of-the-art solutions for its customers. Pie Medical Imaging's customer file includes leading research centers and core labs around the world as well as major equipment manufacturers and local partners. Pie Medical Imaging is dedicated to the development and sales of quantitative analysis software to support medical professionals with the diagnostic process and applied treatment and to facilitate research to study the efficacy of modern interventions. The quantitative analysis software is intended for highly accurate and reproducible measurements of the dimensions of coronary arteries and other vessels as well as the analysis of left and right ventricular volumes.

X-ray angiography remains the imaging modality during x-ray cardiovascular procedures. CAAS A-valve is developed to be used during transcatheter aortic valve replacement (TAVR) to assess the aortic regurgitation (leakage of the valve) after TAVR. The qRA (quantitative regurgitation analysis) workflow within CAAS A-Valve (also called videodensitometry) enables the physician to quantify valvular and paravalvular aortic regurgitation immediately in the cathlab directly after placing the new aortic valve. The imaging method to assess aortic regurgitation is by injection of radiopaque contrast liquid at the ascending aorta. In case there is any aortic regurgitation, the radiopaque contrast liquid will be present (leak) into the left ventricle. The qRA workflow is based on conventional image processing methods, and in general it assessed the amount of contrast within the LV in relation to the amount of contrast in the ascending aorta over several cardiac cycles. Figure 1 represent a screenshot of the qRA workflow within CAAS A-Valve.

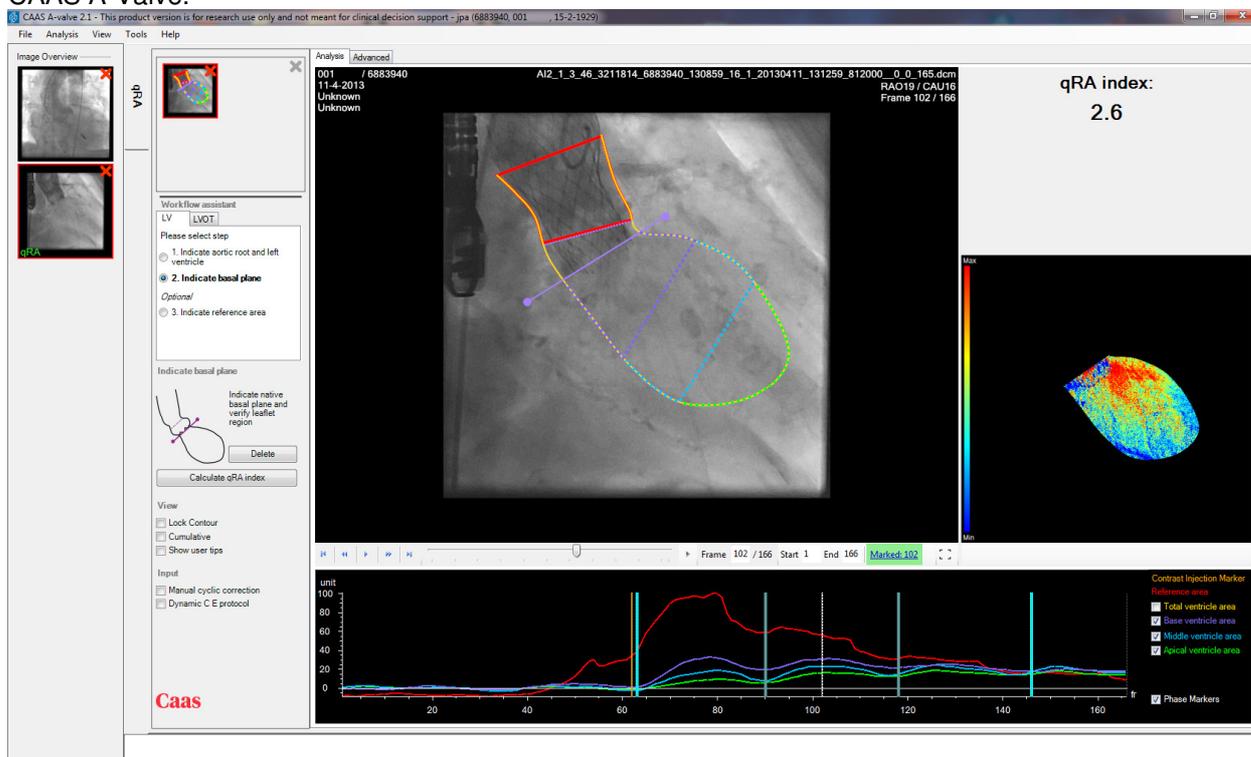


Figure 1 Example CAAS A-Valve's qRA workflow.

The aim of this internship project is to investigate the application of a machine learning (Deep Learning) network to assess the valvular regurgitation. Therefore, a machine learning network should be set up, trained and evaluated. It is important that the network architecture incorporates time information. Evaluation will take place by comparing the results of the trained network with CAAS A-Valve qRA analysis. The applied network and results are written down in a report and presented to the research team within Pie Medical Imaging.

The tasks within the internship project contain:

- Initial phase
 - Draw up a project plan.
- Research phase
 - Perform a literature research
- Development phase
 - Use Keras or TensorFlow for machine learning.
 - Several tools can be used for data evaluation, such as Matlab, TensorFlow, Pytorch and Excel.
 - Documentation of the results.
- Evaluation phase
 - Evaluation of the analysis results.
 - Presentation of the results.