HACKATHON
PROBLEM DESCRIPTION

Date: 20-21 Sep 2019

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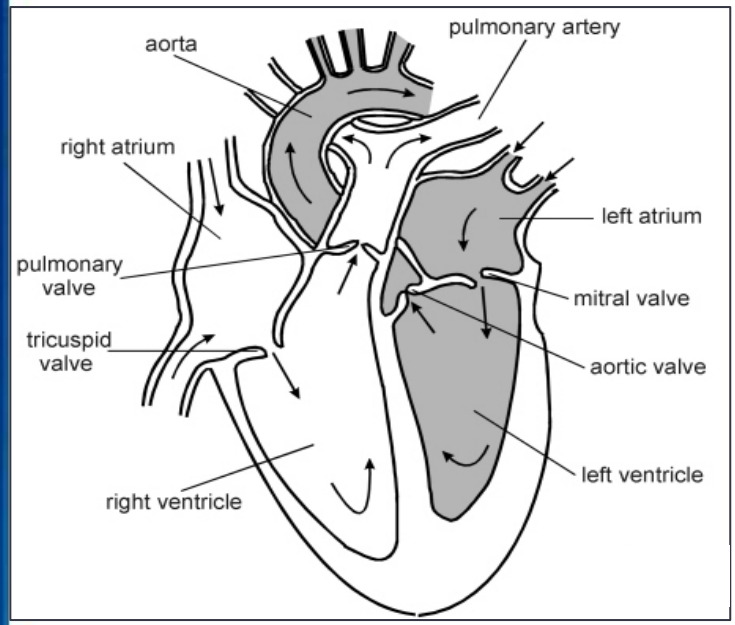
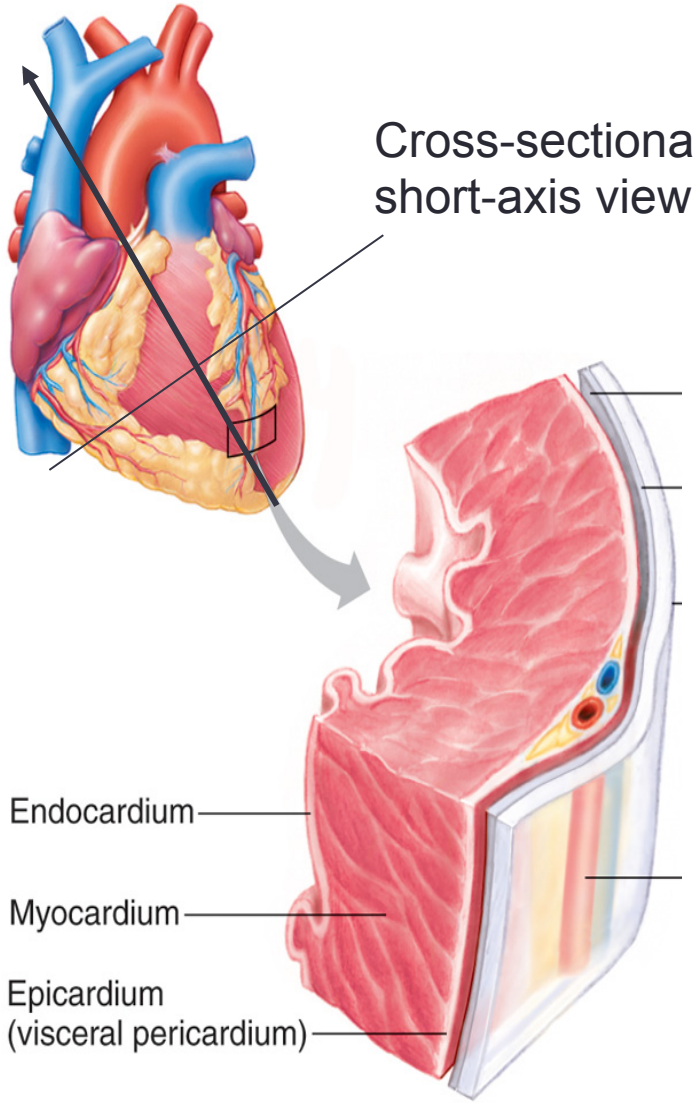
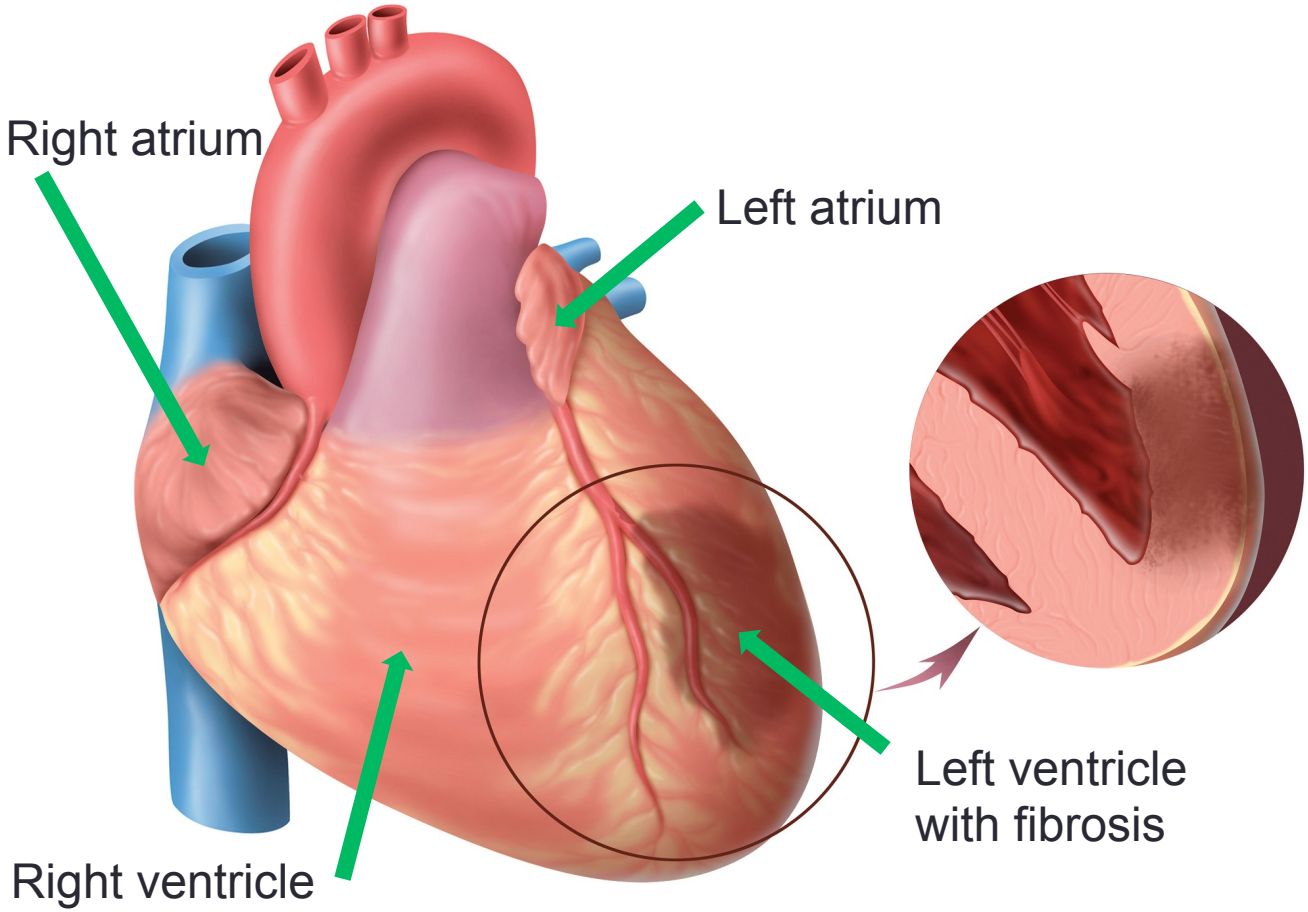
Anatomy of Heart

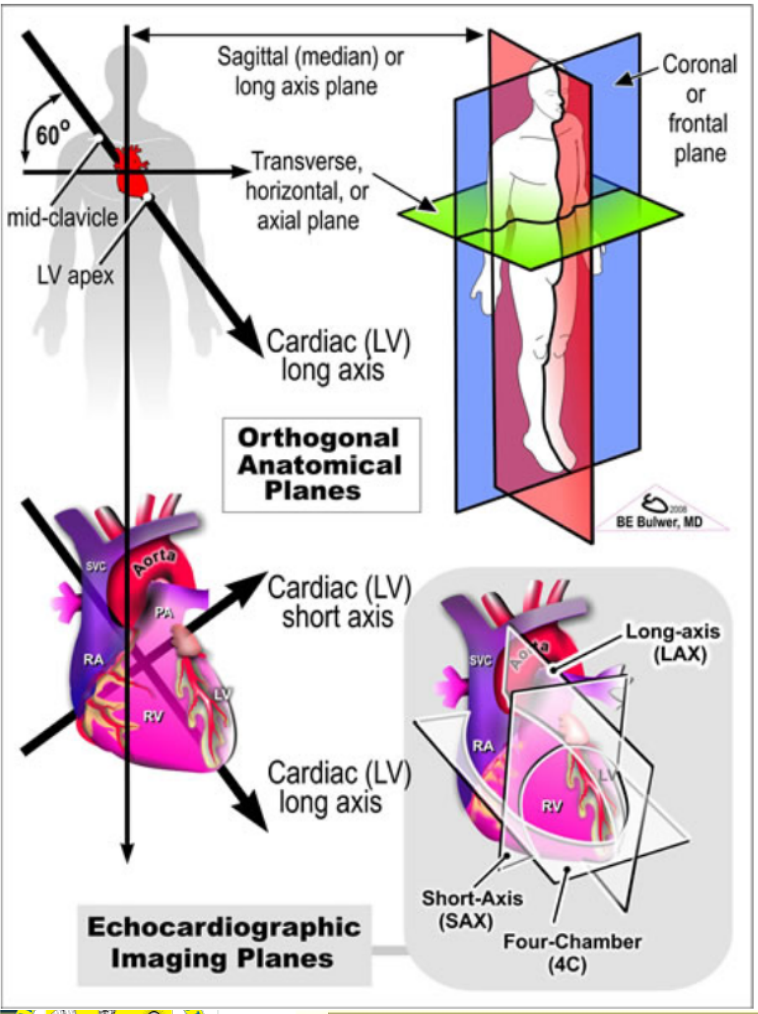




Motivation: Ischemia and Fibrosis



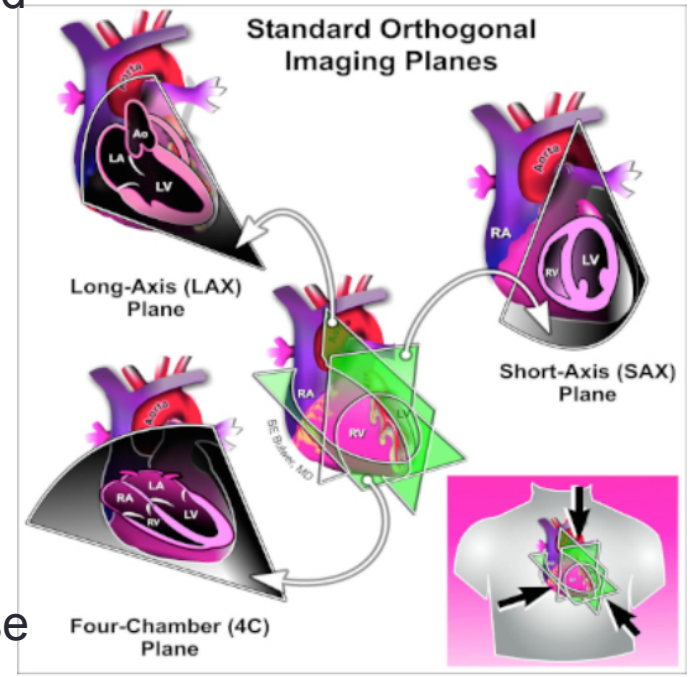
Cardiac Axis Planes



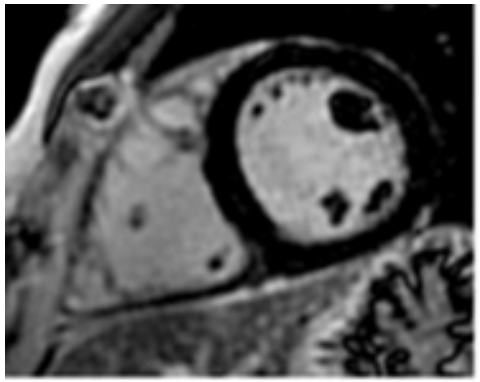
Imaging Methods-

- Ultrasound (High frequency Sound waves)
- Computed tomography/ CT(X-ray)
- Magnetic Resonance Imaging/MRI (Magnetic field)

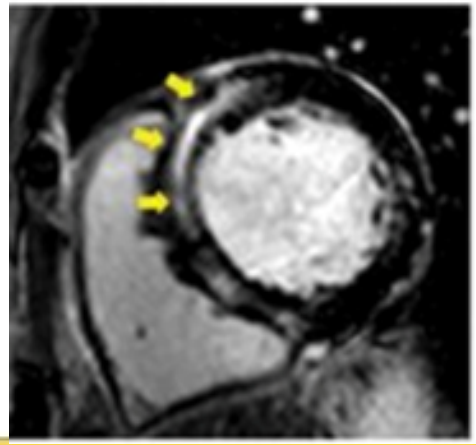
- MRI preferred over CT because of no radiation dosage

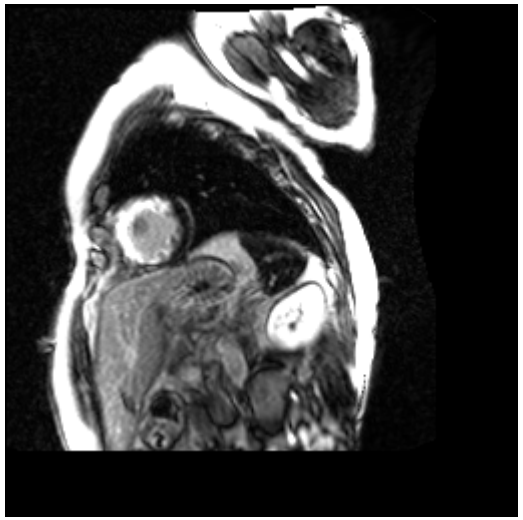


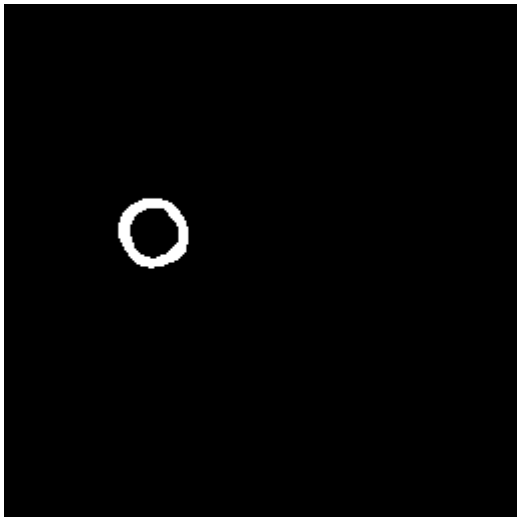
Cross-sectional view of LV and Segmented Myocardium



Myocarditis with no LGE







Images on left side show Left Ventricle (LV) in cross-sectional view. The image at left-bottom shows scars in myocardium

Myocardium segmented from the above image and extracted.

Problem 1
Identification of Myocardium from MRI Short Axis (SAX) Cine Image

Myocardium Segmentation

Some of the ideas are

- Template matching
- Hough transform for circle (disc)
- Convolutional Hough transform
- Scale Invariant convolutional Hough transform

Challenges are

- Shape may not be circular
- Size of myocardium may change

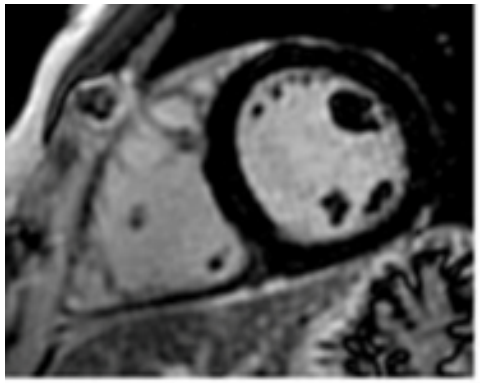
You will be provided with

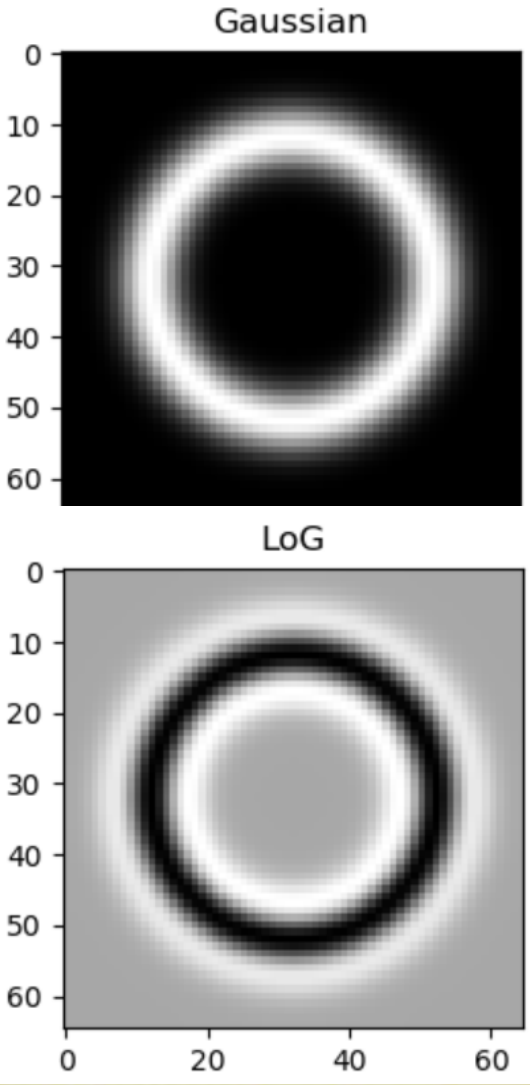
- SAX DICOM images

You will need

- Pydicom [python package] for reading DICOM images

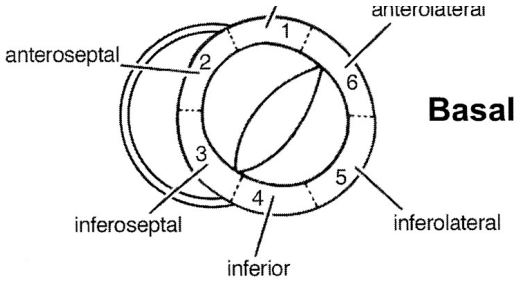
DICOM=Digital Imaging and COmmunications in Medicine

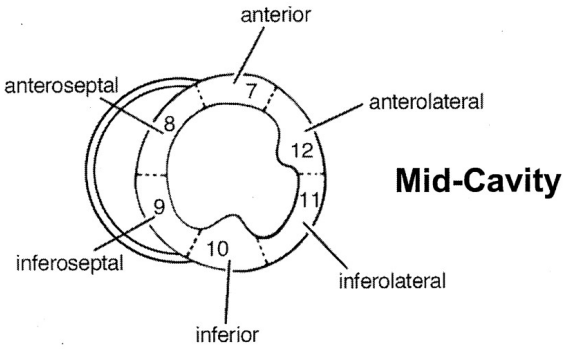


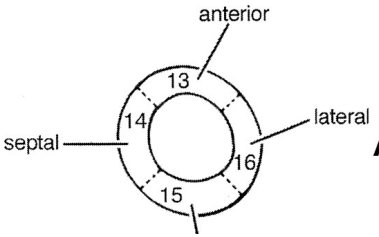


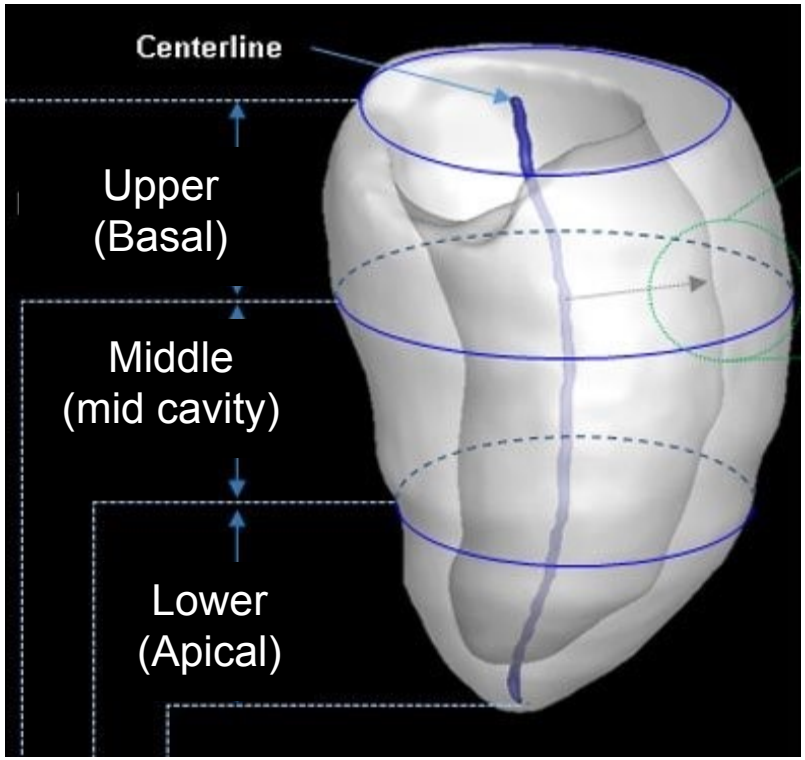
Problem 2
How best to present scar tissues (Bull's Eye)

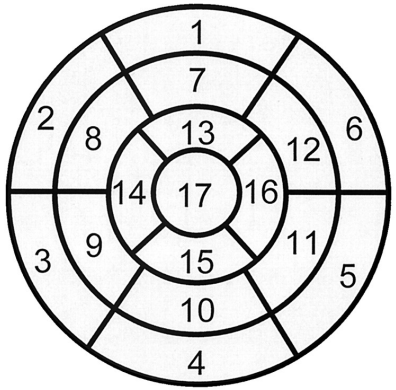
Bull's Eye View



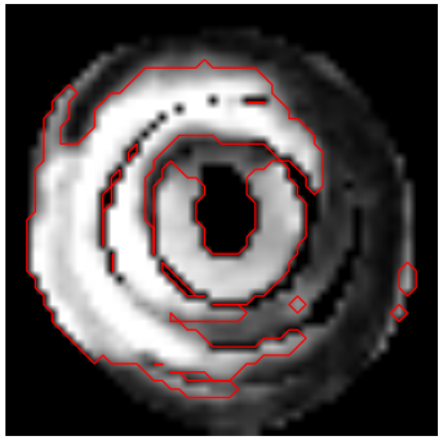


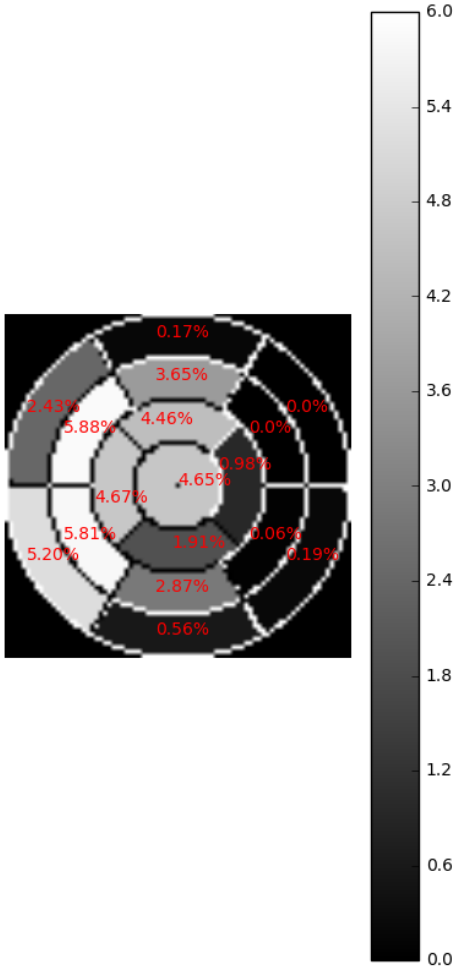






How The Output May Look Like?





You will be provided with-

- LGE MR images and corresponding myocardium masks in 'png' format

You will need to-

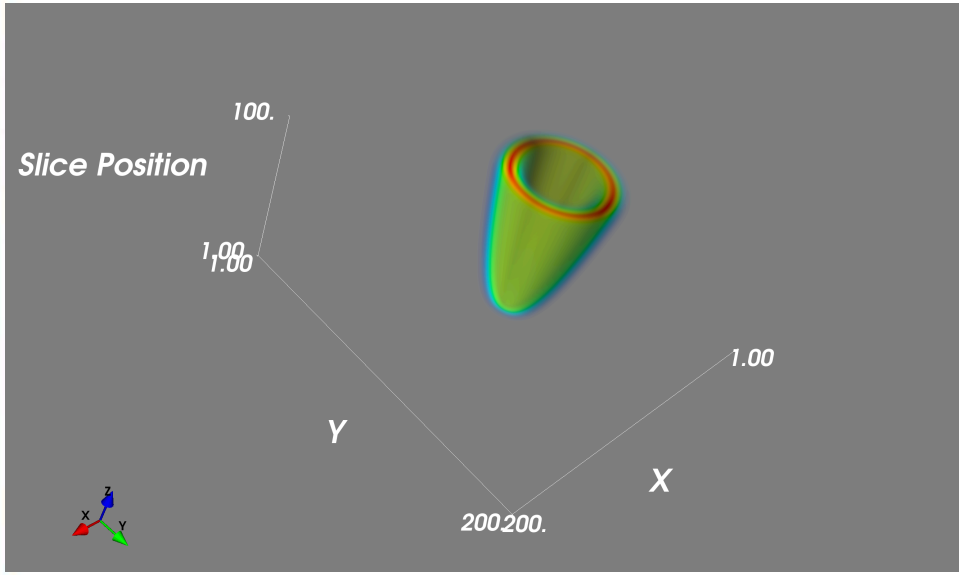
- Stack up and align the slices
- Detect Fibrosis in each of them
- Create 17 segment display with %fibrosis printed scaled to (100/17)%~6%

Problem 3

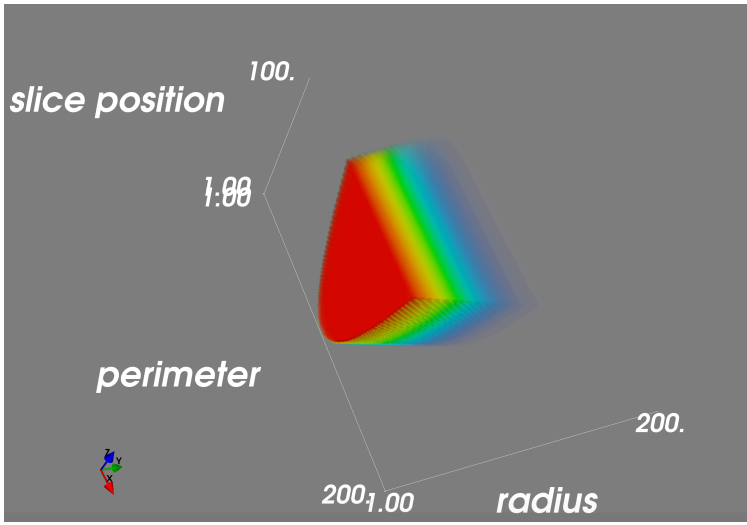
Unfold the myocardium volume and create a 3D curved MPR image from that

Prototype

3D structure of Myocardium



Curved Plane Projection



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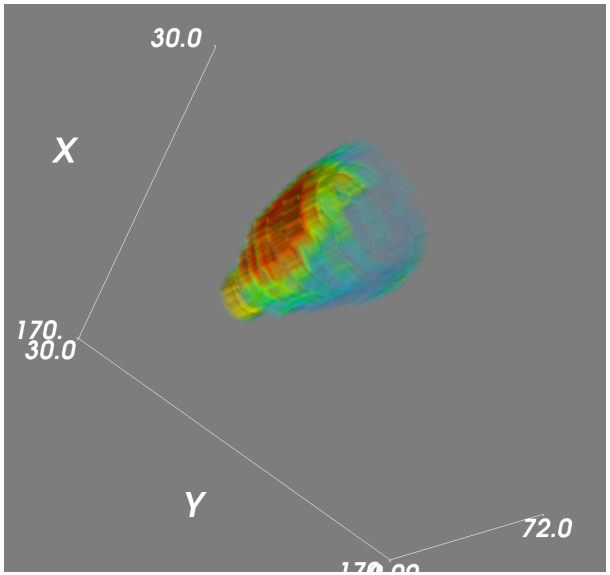

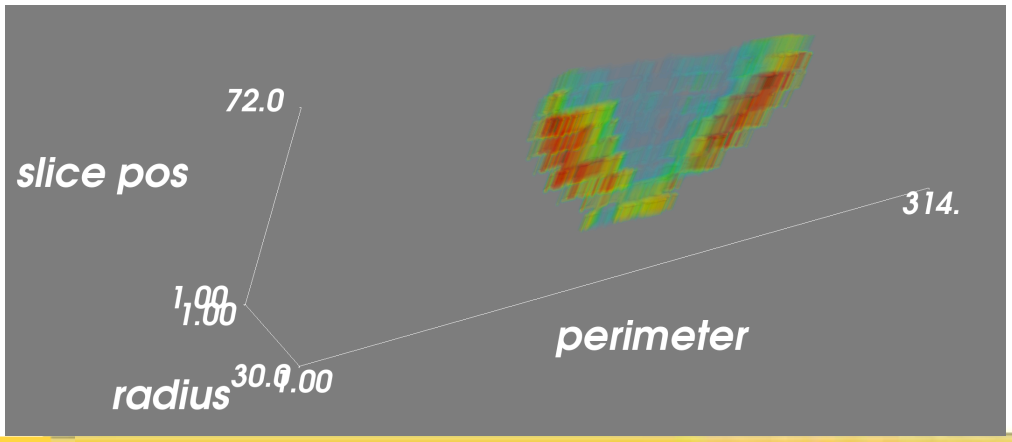

You will be provided with-

- LGE MR images and corresponding myocardium masks in ‘png’ format

You will need to-

- Stack up and align the slices
- Create the 3D myocardium
- Create the curved plane projection for myocardium
- Display cross-section at different radial positions and slice planes