Cairo University – Faculty of Engineering
Academic / Start Up Projects
Fund Request Application Form

Project Name:	Platform for 3D Visualization of Myocardial Scar Using Automatic Segmentation of Cardiac Images
Participating Department(s):	Systems and Biomedical Engineering (Credit Hours System)
Project Summary:	Create automated platform to visualize accurate location of myocardium scars on 3D model of left ventricle and automatically extract clinically relevant parameters. Segmentation of myocardium scars and left ventricle will be achieved using Deep Learning. Data and mentoring needed to accomplish such project is provided through collaboration with Aswan Heart Centre and Research, Magdi Yacoub Foundation. This application will potentially help closing gap between Radiology and Electrophysiology departments by offering means to validate relation between voltage maps used in Electrophysiology and contours of heart acquired in Radiology.
Expected Project Output:	Provide automated platform to detect, visualize and quantify accurate location of myocardium scars on 3D model of left ventricle from cardiac MR images as input

Academic Advisors

Name	Department	Email	Phone Number
Dr. Tamer Youssef Basha	Systems & Biomedical Engineering Cairo University	tamer.basha@eng1.cu.edu.eg	01003363916
Dr. Nairouz Shehata	Biomedical Engineering Imperial College London	nairouz.shehata@aswanheartcentre.com	Egyptian Number Not Available
Dr. Mohamed Nagy	Aswan Heart Centre and Research, Magdi Yacoub Foundation	mohamed.nagy@aswanheartcentre.com	01115312612
Dr. Amr Elsawy	Aswan Heart Centre and Research, Magdi Yacoub Foundation	amr.elsawy@aswanheartcentre.com	01016444225

Participants

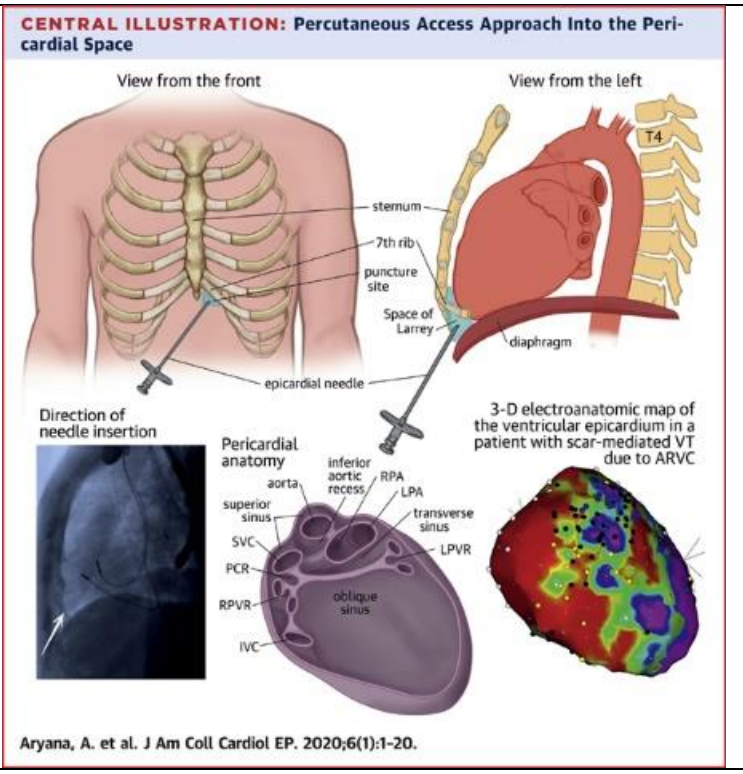
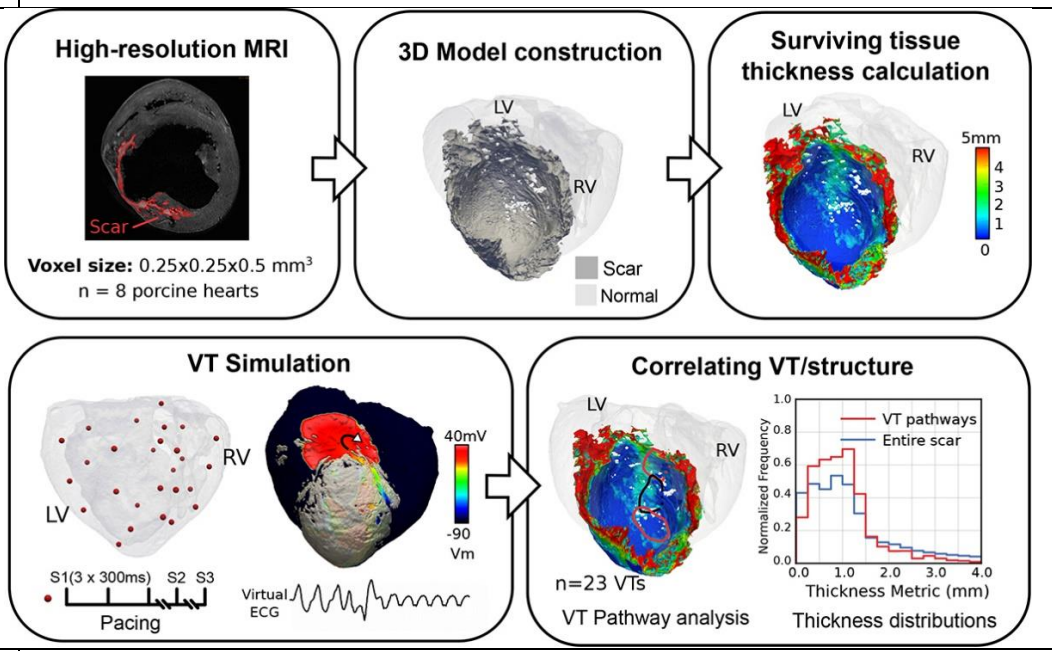
Name	Department/Year	Email	Phone Number
Abdallah Mohamed Galal Elsuhaimy	HEM/ 4th Year	abdallah.elsuhaimy@gmail.com	01118039990
Ola Ayman Abdelfatah Elmaghraby	HEM/ 4th Year	ola.maghraby00@eng-st.cu.edu.eg	01097277904
Pierre Amir Bassily Farag	HEM/ 4th Year	pierre.farag00@eng-st.cu.edu.eg	01009722979
Sandra Adel Aziz Gebraiel	HEM/ 4th Year	sandra.gebraiel99@eng-st.cu.edu.eg	01001111233

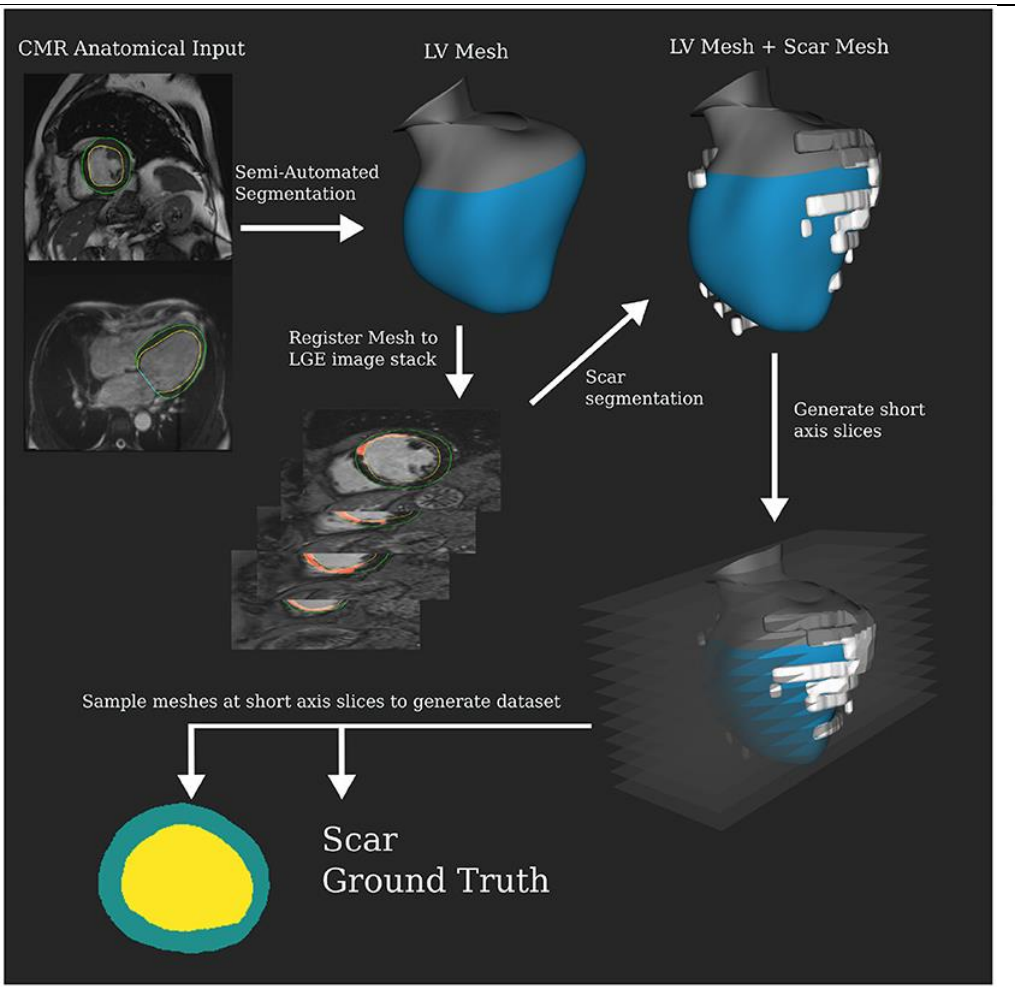
Time Plan	
Task	**Date**
Getting Acquainted with: 1) Cardiac MRI, 2) Deep Learning for Segmentation, 3) VTK Library for 3D Visualization	December
Visualize and Animate Segmented Contours in 3D	January
Automatic Segmentation of Left Ventricle from MR Cine Images	February
Automatic Scar Detection from Contrast-Based Images	March
Registration of Cine and Contrast-Based Images in 3D	April
Propagation of Registered Contours in Time Dimension	May
Polishing Final Output Platform: + *Input* → Cine and Contrast-Based Images, + *Output* → 3D Model of Left Ventricle with Scar Embedding	June

Budget Plan (Preliminary)		
Item / Material	**Cost (EGP)**	**Notes**
Google Colab Pro Plus Subscription	8750 (For 7 Months)	*1250 Per Month* Subscription Offers Enough Processing Power and Memory for Required Deep Learning Work Using Big Data
3D Visualization Software Packages for Medical Applications	2000	
Total Budget For Project:	**10,750 EGP**	

Funding Sources	
Current Funding Sources:	*None*
Intended Funding Sources:	Additionally Applying for ITIDA and The Academy of Scientific Research and Technology (ASRT) Graduation Project Funding Opportunities

Signatures	
Contact Student Name 1:	Ola Ayman
Contact Student Signature 1:	Date: / /
Contact Student Name 2:	Sandra Adel
Contact Student Signature 2:	Date: / /
Academic Advisor Name:	Dr. Tamer Basha
Academic Advisor Signature:	Date: / /
Program Coordinator Name:	Dr. Sherif Samy
Program Coordinator Signature:	Date: / /

Process Diagram	
	
Description	Physicians in Electrophysiology department identify scars by using of an epicardial needle and measuring voltage signal of tissue to determine whether it is fibrous and signals are finally constructed as 3D electro-anatomic map as shown in previous figure which is time consuming.
	
Description	Alternatively, physicians in Radiology department can generate 3D model for heart using MRI and CT images to calculate parameters as tissue thickness and ejection fraction of heart.



Description	Our solution is to combine two different types of images to benefit from various information extracted from each type. First Type is cine images, which have high resolution and large number of slices covering heart. Second type is LGE images, where scars are clearly identifiable. Then, we construct 3D model visualizing scars of heart accurately, which can later be used in Electrophysiology to make heart mapping operations more time efficient.