

Non-Invasive Assessment of Cardio-Aortic Mechanics

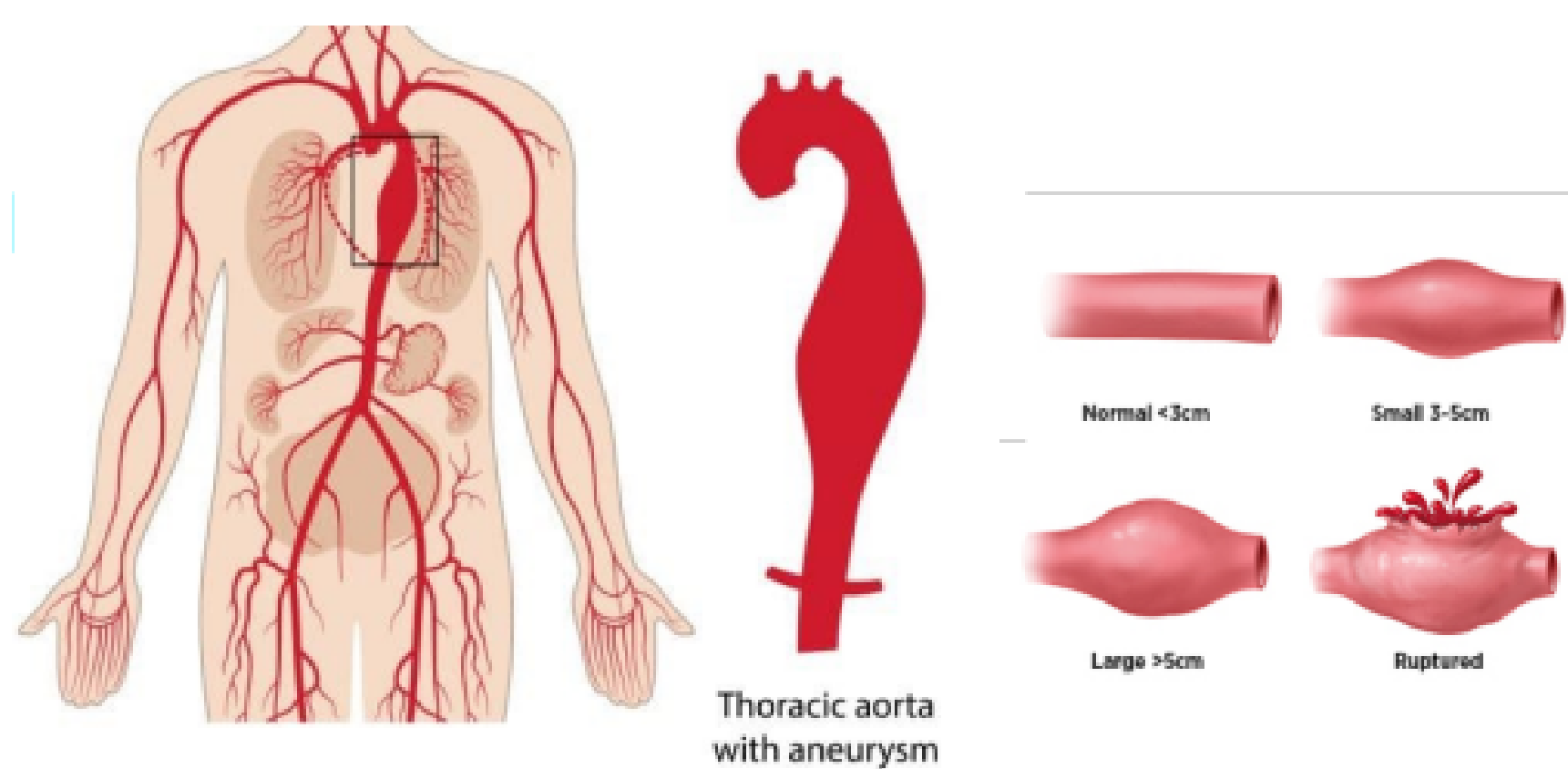
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To be used for the first time to describe the Mechanical properties of the at risk aorta in Vivo using Echocardiographic Aortic strain, Central Arterial Pressure with Applanation Tonometry and Aortic blood flow with a Doppler.

01 Introduction

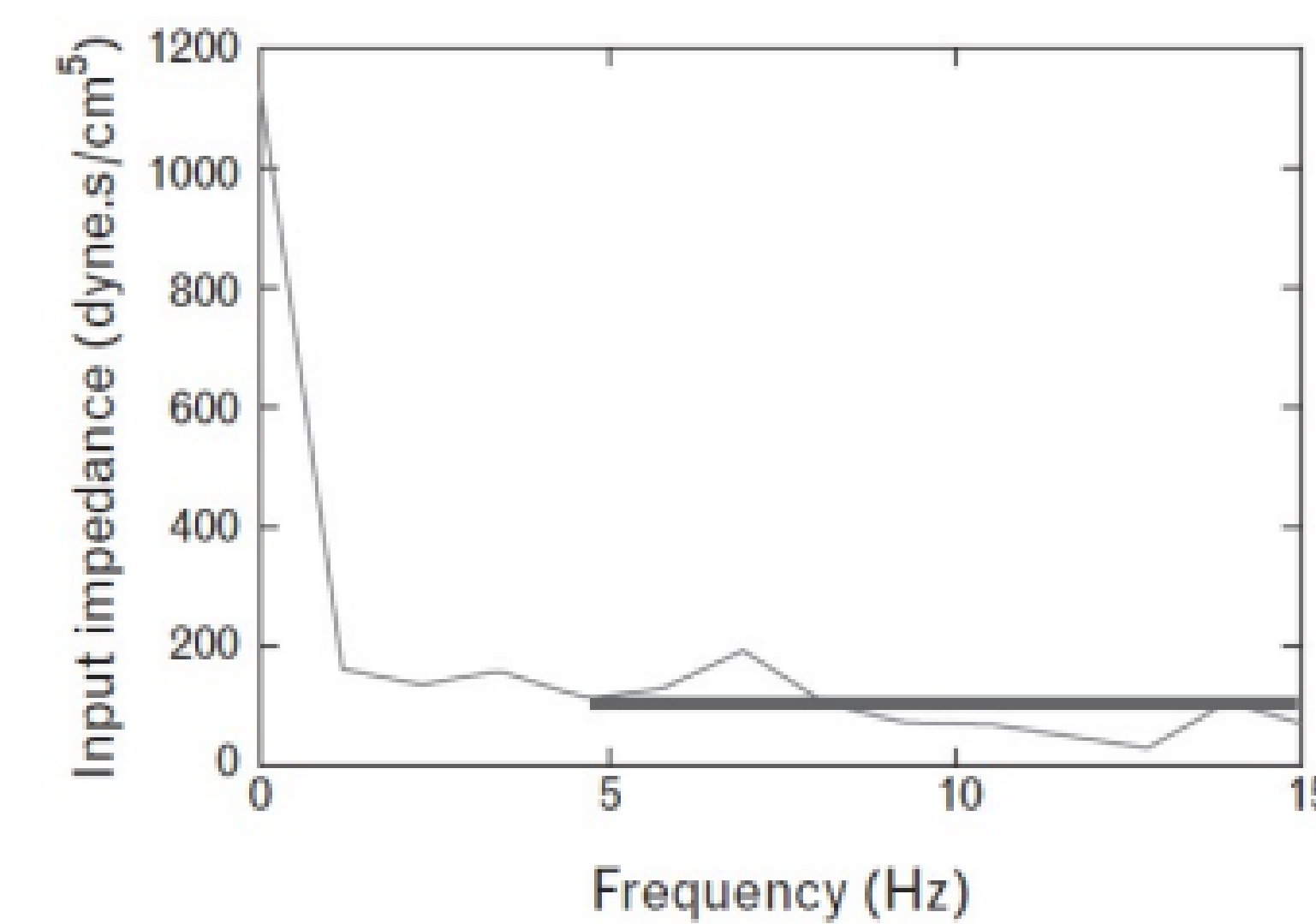
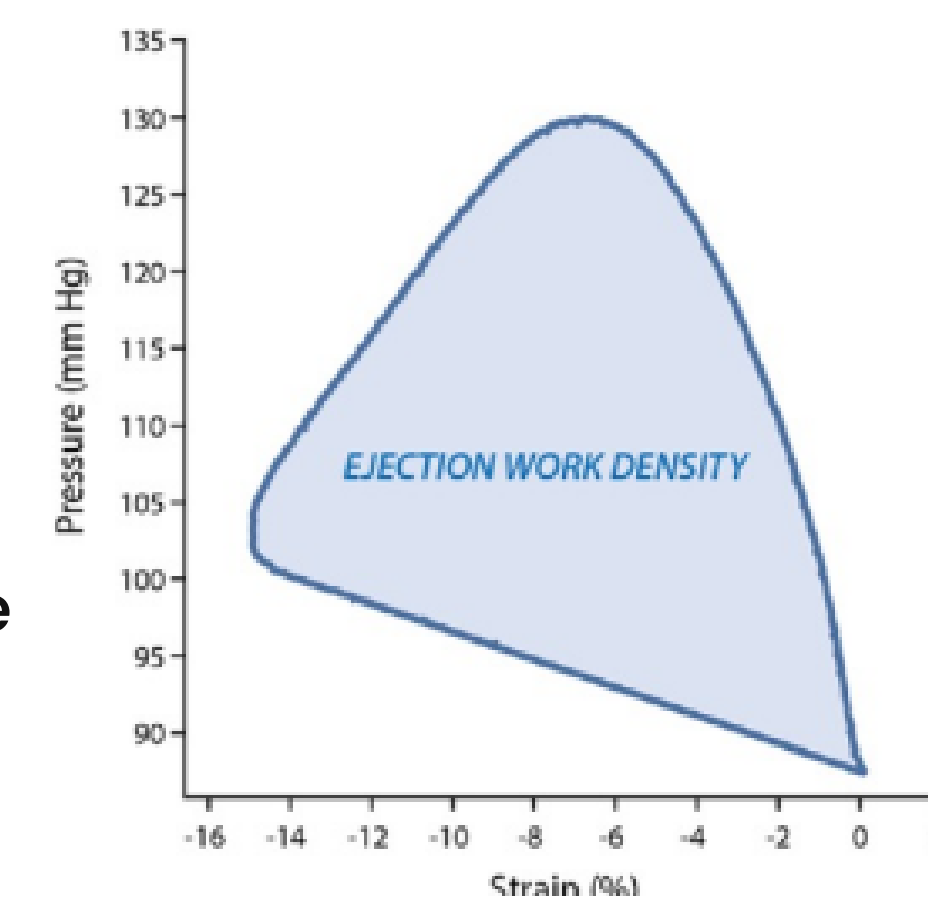
- The Aorta: Outflow artery from The heart that carries blood at high pulsatile pressures to the body.
- The Mechanical integrity of the aortic wall is determined by its composition: Cells and Fibrous Proteins.
- Patients with genetic disorders are prone to aortic mechanical failure
- Aneurysm: Ballooning of the aortic wall that can lead to mechanical failure.



02 Objective

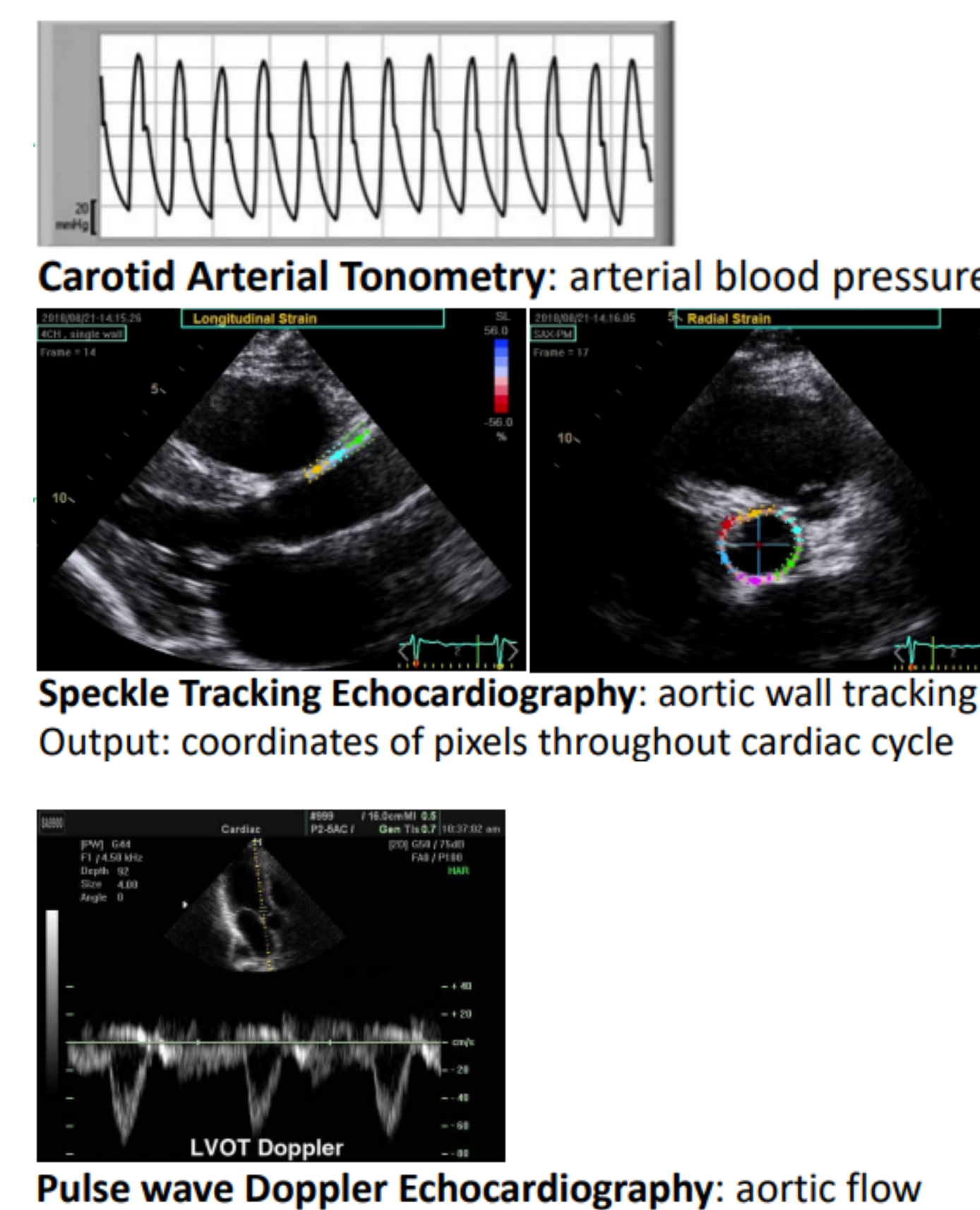
Develop algorithms and a user interface to take the raw data provided and output:

- Carotid artery pressure and aortic strain data to construct pressure strain loops.
- Carotid artery pressure and aortic flow to derive aortic impedance.



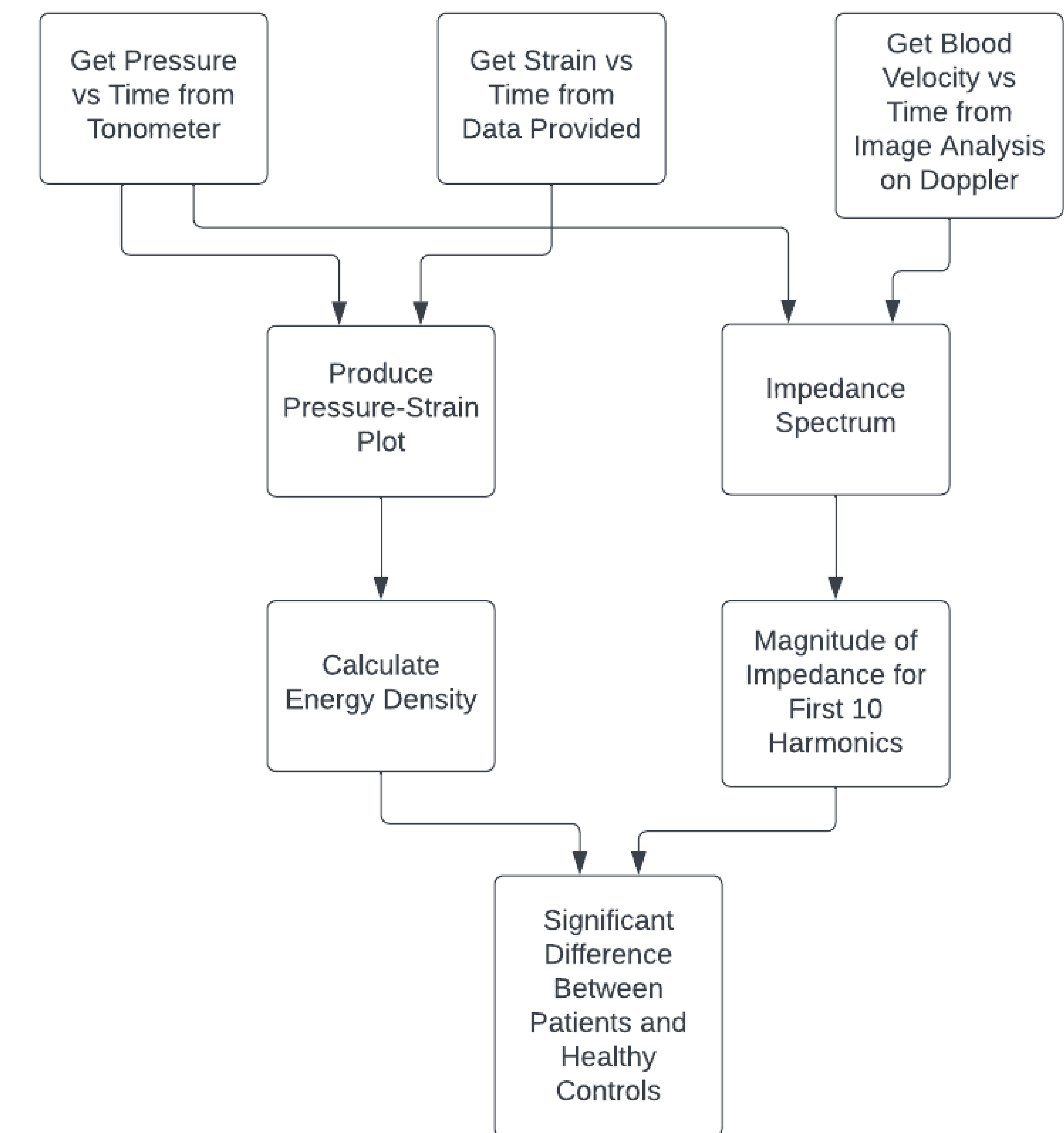
03 Data

There will be 3 different types of data used in this project. All three have already been provided and are shown below:



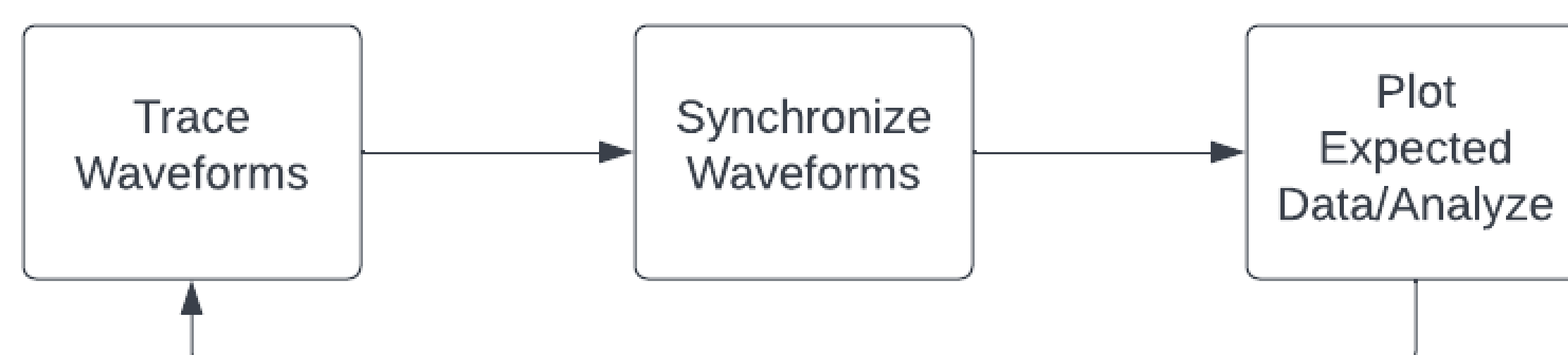
04 Details of Design

To process this data we will be building on a Matlab script that was provided from last years group. We will be altering last years code as the output that was obtained was not up to the standards of the supervisors. A block diagram for the program that will be created is shown below:



05 Future Work

Our next task will be to determine the best way to trace the waveforms. The waveforms will then need to be synced with the ECG data provided. We will then output the expected data and assess the accuracy.



06 Next Steps

This project is scheduled to be completed in December of 2022. There is significant work to be done before then for this project to be successful. See the Gantt chart below to view the plan for the rest of the project.

ID	Task	Start	Finish	Duration	Progress	Resources	Feb 01, 2022	Mar 01, 2022	Apr 01, 2022	May 01, 2022	Jun 01, 2022	Jul 01, 2022	Aug 01, 2022	Sep 01, 2022	Oct 01, 2022	Nov 01, 2022
1	Research	2022-01-18	2022-02-16	30 d	100%	All Group Members	█									
2	Design Plan	2022-02-17	2022-09-07	203 d	20%	All Group Members		█	█	█	█	█	█	█	█	█
3	Verification	2022-08-15	2022-10-07	54 d	0%	All Group Members							█	█	█	█
4	Validation	2022-10-07	2022-11-04	29 d	0%	All Group Members									█	█
5	Deliverables	2022-11-07	2022-12-07	31 d	0%	All Group Members										█

The most challenging task in the block diagram will be deciding the most accurate method of tracing the Doppler Spectrograms. We will be testing either tracing the waves by hand or using image analysis in Matlab. There is a lot of noise present in these waves which will be the most important thing to try and remove to get a measurable output.

Acknowledgements

Team 7 would like to thank our external supervisors Dr. Sarah Wells and Dr. Gabrielle Horne as well as our internal supervisor Dr. Robert Adamson for their help with developing the ideas that will go into this software. All diagrams used in this poster were created by our external supervisors and presented to us or by our team using a block diagram software.