Web-based heart statistical shape model

Project Management and Software Development for Medical Applications

General Info

Virtonomy.io

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Project Abstract

Statistical shape modelling (SSM) is often used to analyze the shape variance of the anatomy within a specific population cohort. This way, it is possible to perform numerical simulations on populational covering shapes, which ultimately can help medical implants' manufacturers in the verification and validation processes. The purpose of the current project is to implement a web-based interface to visualize and generate shapes. The interface should allow users to measure different metrics on the anatomy as well as estimate the variance of such measurements within the training cohort. It should also allow the users to better understand the mapping of the different variation modes on the local anatomy. Successful outcome of the project will be deployed Virtonomy's SaaS web platform.

Background and Motivation

Virtonomy GmbH is developing the first web platform for conducting fully data driven clinical trials of medical devices with the use of virtual patients. Our system is based on clinical scans (CT, MRI), pathology data and data about the medical devices. The 3D anatomy model reconstruction from image data is one of the key parts of the entire processing pipeline. A statistical approach to the population of these models can give room to populational covering simulations on the performance of a given heart implant. With this, virtual testing is promoted making human and animal studies slowly less and less needed.

Student's Tasks Description

- Extend an already existing web-based interface to SSM manipulation;

- Establish a correspondence between the shape modes and the anatomical variance;

- Shape reconstruction from partial data input; bring existing calculations from python to the frontend

- Export/import shape mesh for simulation studies.

At the end of the project, the student shall have the following outcome: a web-based SSM visualization interface and all the relevant source code in a GIT repo. The student will learn how to build populational analysis studies and render the results on a web-tool. Virtonomy will provide supervision with medical industrial deep learning training and software development experience.

Technical Prerequisites

JavaScript
Preferably: three.js and/or aframe
Optional: React, understanding python code, webworker
Basic understanding of GIT.

Why you should choose us

- Opportunity to work in an international start-up environment or remotely
- Participation in the exciting development and growth of a start-up
- Contributing to an exciting real-life medical data solution with impact

References

https://github.com/sarbabi/WebSSM

https://ankleshapemodels.com/