Breast imaging viewer

Project Management and Software Development
for Medical Applications

General Info
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Project Abstract
Hera-MI is a medical imaging software company building computer-aided diagnosis (CAD) solutions. These solutions rely on machine learning (esp. deep learning) techniques and often operate as black boxes, taking images on input and generating a prediction or some images. There is a well-established data pipeline in the clinical environment, however when showcasing (e.g., demoing, congress, conferences), the situation is less obvious. That is, we need a flexible and configurable tool allowing us to handle the imaging and demonstrate the software features from various angles. During this project you will have an opportunity to work on a proprietary codebase built on top of well-known projects such as VueJS and CornerstoneJS and enhance the user experience and the features of the multi-modality breast imaging viewer tool (BIVi).

Background and Motivation
The goal of the project is to enhance current proprietary medical imaging viewer used in showcasing environment by implementing new features and improving the existing ones. Here below are introduced the main features we will focus on.

Imaging interoperability
The breast cancer screening is based on several imaging acquisitions, in particular, 2D and 3D mammography, called respectively Full Field Digital Mammography (FFDM) and Digital Breast Tomosynthesis (DBT). There are usually either 2 FFDM acquisitions per breast, or at least 1 FFDM and 1 DBT acquisition. These acquisitions can be displayed in different order, and several acquisitions are often displayed simultaneously on the screen. When several images are displayed, some of the operations, such as zoom, pan, contrast enhancement, are to be properly synchronized. Hence, we will focus on the implementation of flexible synchronization rules allowing for efficient imaging interoperability.

Cases handling: The BIVi tool allows for navigating in different cases and accessing images of these cases. Unfortunately, the import and processing of the cases still require a substantial amount of manual operations. Hence, we would like to build an easy-to-use data processing pipeline allowing us to integrate new cases in the tool. Moreover, we would like to allow the operators to mark or group these cases (e.g., by type of pathology), in order to access these cases faster.

Student’s Tasks Description
Finally, we would like to enrich the user experience allowing to access CAD predictions. This will require working on both, user interface and data pipeline, while we will seek for a more intuitive and faster access to the predictions.

Technical Prerequisites
Full-stack software engineering:
- backend: Python (optional),
- frontend: Javascript (required), VueJS (optional), CornerstoneJS (optional), HTML (required), CSS (required)
- database: mongodb (optional)
- Infrastructure: Docker (optional)

References
[1] https://www.era-mi.com/

Please send the completed proposal to ardit.ramadani@tum.de, zljiang@tum.de, lennart.bastian@tum.de and tianyu.song@tum.de. Please note that this proposal will be evaluated by the BMC coordinators and will be assigned to a student only in case of acceptance.