



# CVAT for Medical Imaging

## Project Management and Software Development for Medical Applications

### General Info

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### Project Abstract

CVAT [1] is a well known open-source image annotation tool offering rich features for efficient images labeling. The generated labels can be later used for the algorithm's design and validation. CVAT is commonly used for natural image and video annotation and numerous resources are available on the web to illustrate its rich capabilities. While medical images can also be annotated using CVAT, there are a few flaws making precise annotation quite difficult. In this project, we will focus on the enhancement of the CVAT features, aiming for a better user experience while annotating medical imaging with CVAT. The successful development of the project will allow to make a community impact with publicly available code.

### Background and Motivation

The goal of this project is to improve user experience when annotating medical imaging with CVAT. Hence, we will use the CVAT source code as the starting point and build our own codebase on top of it. Here below are the main topics we will focus on during this project.

#### 3D imaging review

Many medical imaging modalities are of 3D nature: Computer Tomography (CT), Magnetic Resonance Imaging (MRI), Digital Breast Tomosynthesis (DBT). Most commonly, each acquisition is a stack of images that altogether depict one or several organs in 3D. Unfortunately, CVAT does not easily allow to group the annotation activity per a stack

of images: that is, it does not easily allow to separately annotate a stack of images. So we will try to improve that by bringing changes both in front- and backend.

#### Imaging layouts

Medical imaging exams are often composed of several acquisitions. For example, a breast cancer screening exam is composed of at least 4 images, 2 per breast. When interpreting the medical imaging exams, the reviewer may need to see all of the acquisitions to evaluate a given area. Unfortunately, CVAT is designed to display and interpret one image at a time. Hence, we want to offer a possibility of displaying several images on the screen (grouped for example by UID of the exam).

#### Student's Tasks Description

As mentioned earlier, a medical imaging exam is composed of several acquisitions. In case of breast cancer screening, there are several 2D and 3D acquisitions of the same breast, that can be X-Ray imaging, ultrasound, and MRI. Since these modalities depict the same organ, they might show the same findings from different angles. Hence, we would like to offer a possibility to easily link the labels on different acquisitions of the same organ (or the same patient).

#### Technical Prerequisites

Full-stack software engineering:

- backend: Python (required),
- frontend: Javascript (required), React (optional), Webpack (optional), HTML (required), CSS (required)
- database: Postgresql (optional)
- Infrastructure: Docker (optional)

#### References

[1]([https://github.com/opencv/opencv\\_demos/tree/master/cvat](https://github.com/opencv/opencv_demos/tree/master/cvat))

[2]<https://www.hera-mi.com/>