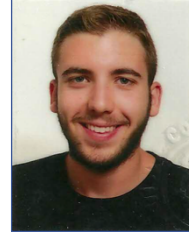## FOUNDATION MODEL FOR BONE SEGMENTATION BASED ON TRANSFORMER ARCHITECTURES

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Background

Medical image segmentation is a fundamental component of medical imaging analysis. Deep learning models have spread a lot in this field, but most of them are still task-specific and therefore their application in practice is limited, since they are not flexible to changes. Hence, some recent studies investigated segmentation foundation models, such as SAM, that are able to segment anything in images, including objects they have never seen, partially overcoming these limitations.

Objectives

The main goal of my project is to create a universal model that, once trained by fine-tuning of SAM, will be specialized in segmenting any bone from many types of medical images, exploiting the capabilities of SAM with respect to previous models.

Methodologies

The project is divided into 5 phases. The first phase is about data collection, which involves collecting as many annotated data as possible for the model fine tuning. The second one regards data preprocessing, needed to standardize the data. The third phase consists in the adaptation of the SAM model architecture to make it able to process 3D medical images. The fourth phase concerns the training and fine-tuning of the model. The last phase is about testing and evaluating of the model, inspecting its performance to highlight strengths and weaknesses.
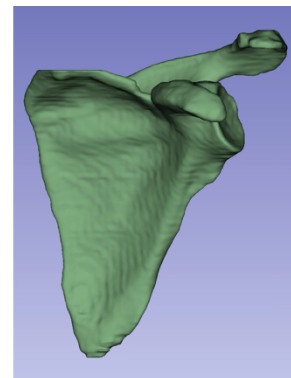

FIGURE 1. EXAMPLE SEGMENTATION MASK OF A SCAPULA BONE

Expected Results and Impact

The final objective of the project is to create a segmentation tool that works with the most common medical image types and that doctors can interactively use to segment bones giving it some prompts. This can automatize the long process of segmentation and give doctors an immediate mask of the interested bones. The interaction can happen both with bounding boxes, with which doctors can specify the body zone where they want to segment the bones, and eventually also with text prompts, in which they can write which bones they want to segment.