

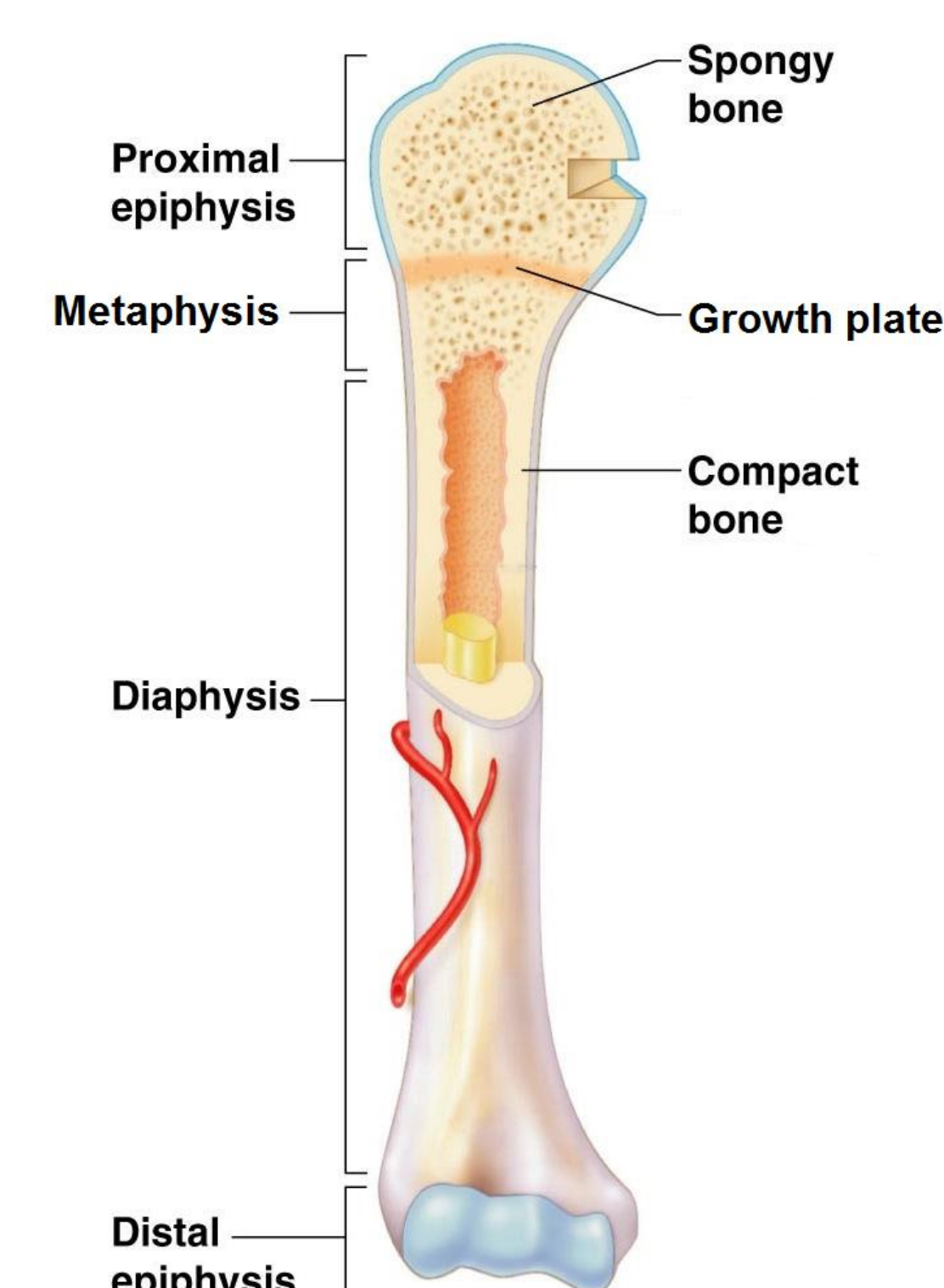
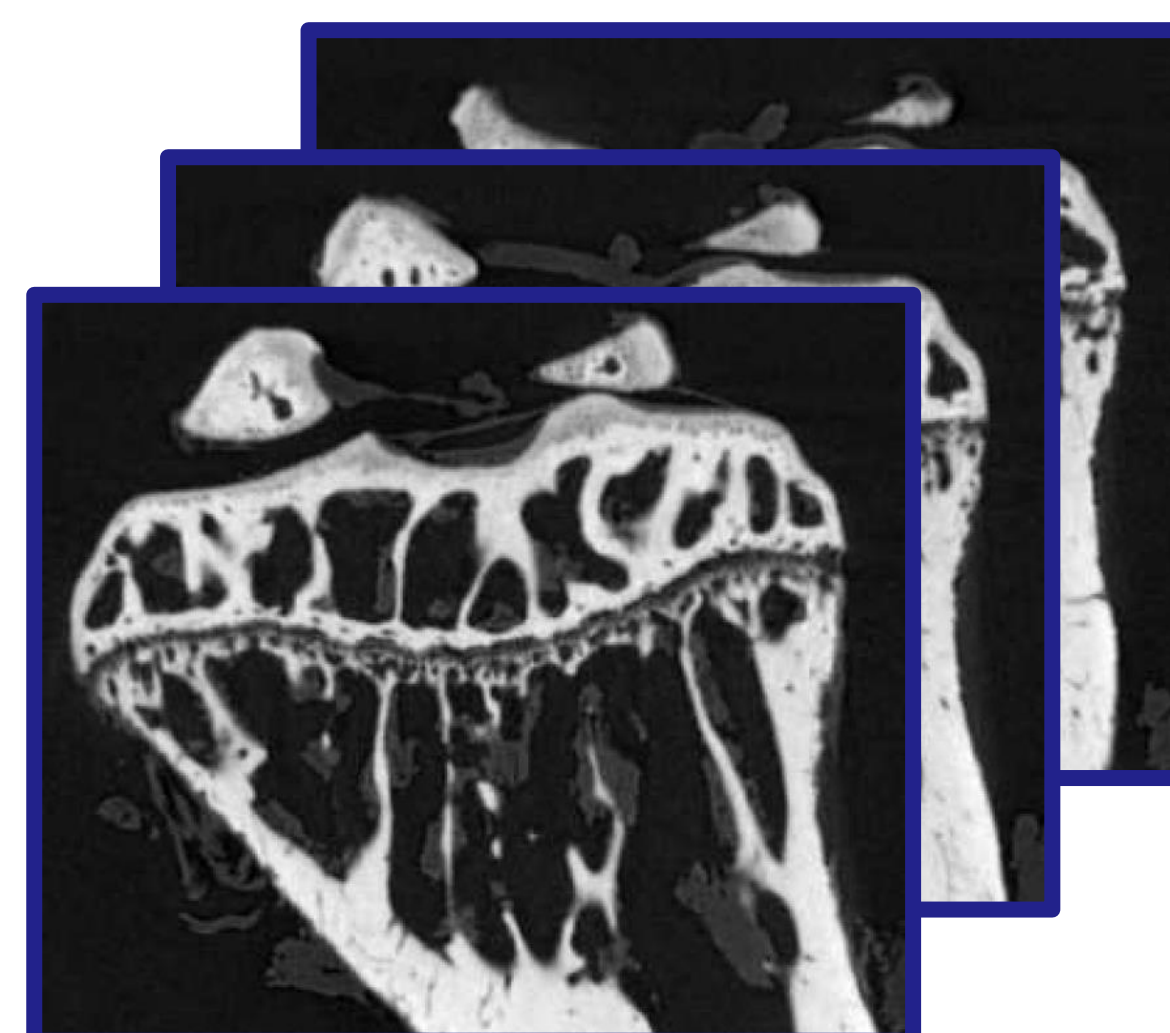
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B.Sc. Students, Bachelor Thesis

Postmenopausal osteoporosis is the most common form of osteoporosis. It affects many women after menopause because of the lack of estrogen. Removal of the ovaries in mice has become a common model for postmenopausal osteoporosis research because it leads to estrogen depletion as well. Osteoporosis weakens bone due to a loss of bone mass.

This project focuses on the development of methods for quantification and segmentation of different bone textures to evaluate whether a mouse is healthy or ovariectomised

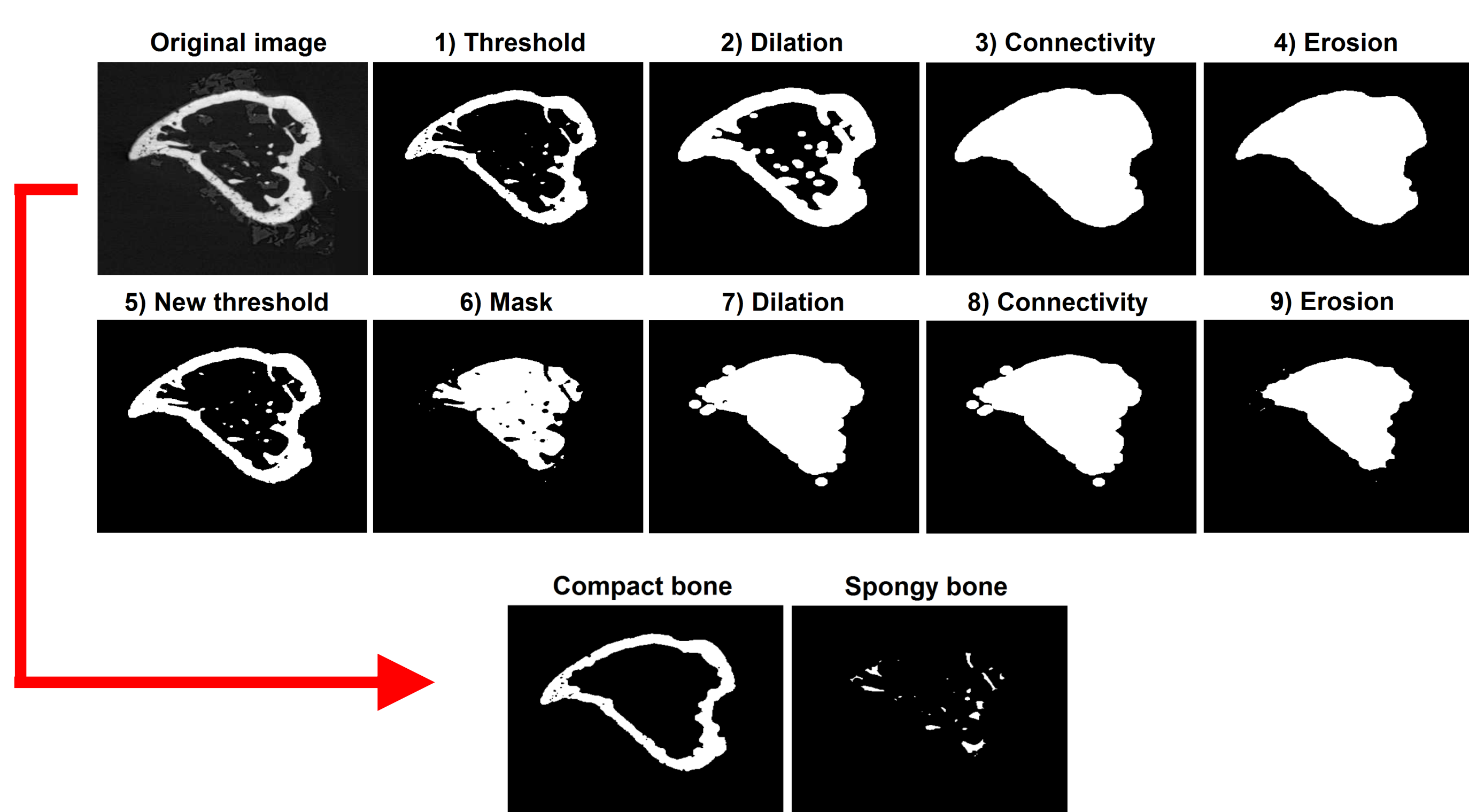
## Data and Bone anatomy

The methods will be used on volumetric  $\mu$ CT scans in different resolutions. The CT-scans is of the tibia which is in the category of long bones which consist of an outer layer of compact bone and inner spongy bone. Bone loss has been registered in the spongy bone in the metaphysis which is investigated in this project. Furthermore the growth plate will be analyzed.



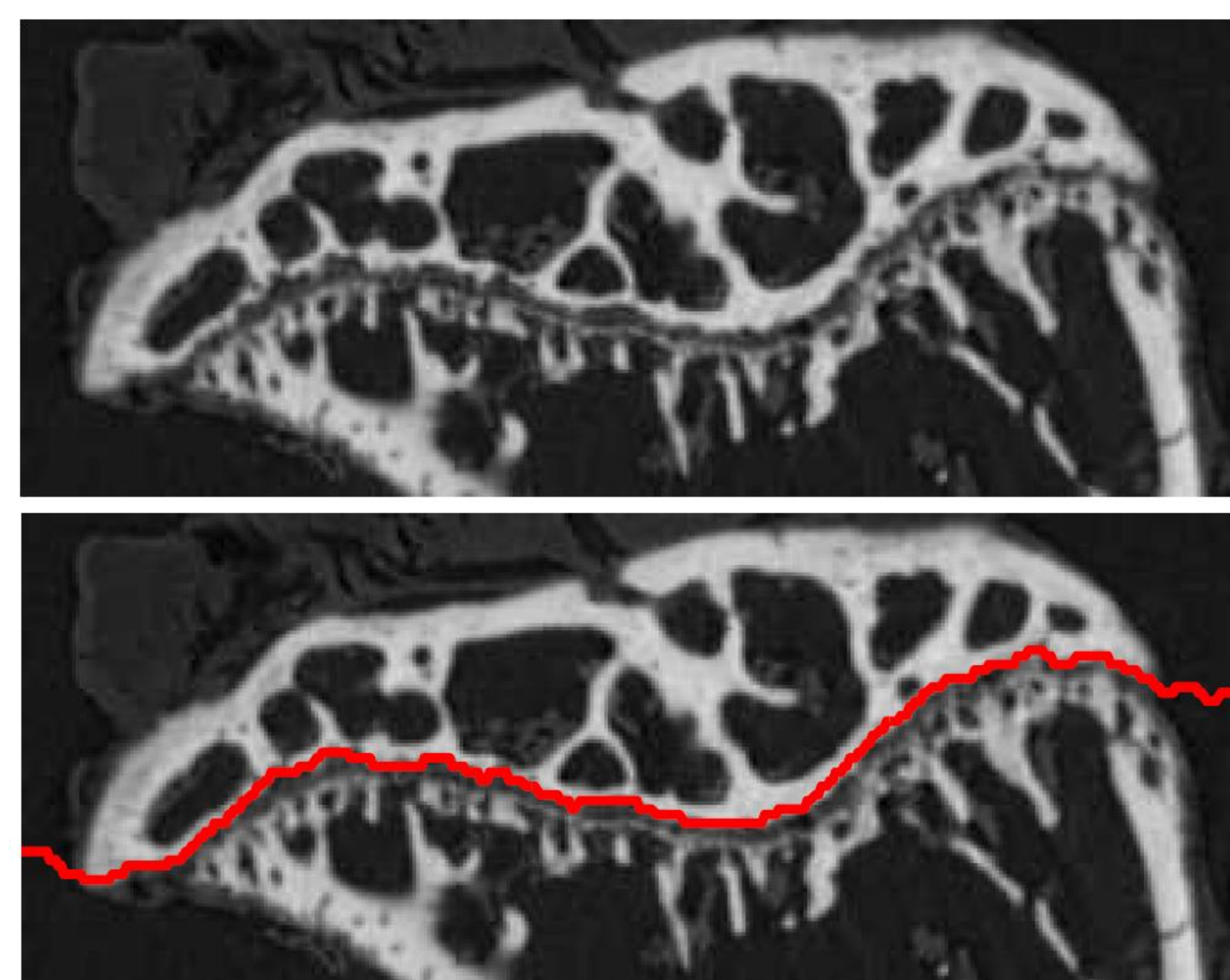
## Dual Threshold Method

To segment compact and spongy bone a dual threshold method has been developed. The dual threshold method uses thresholds, morphological filters, and connected components.



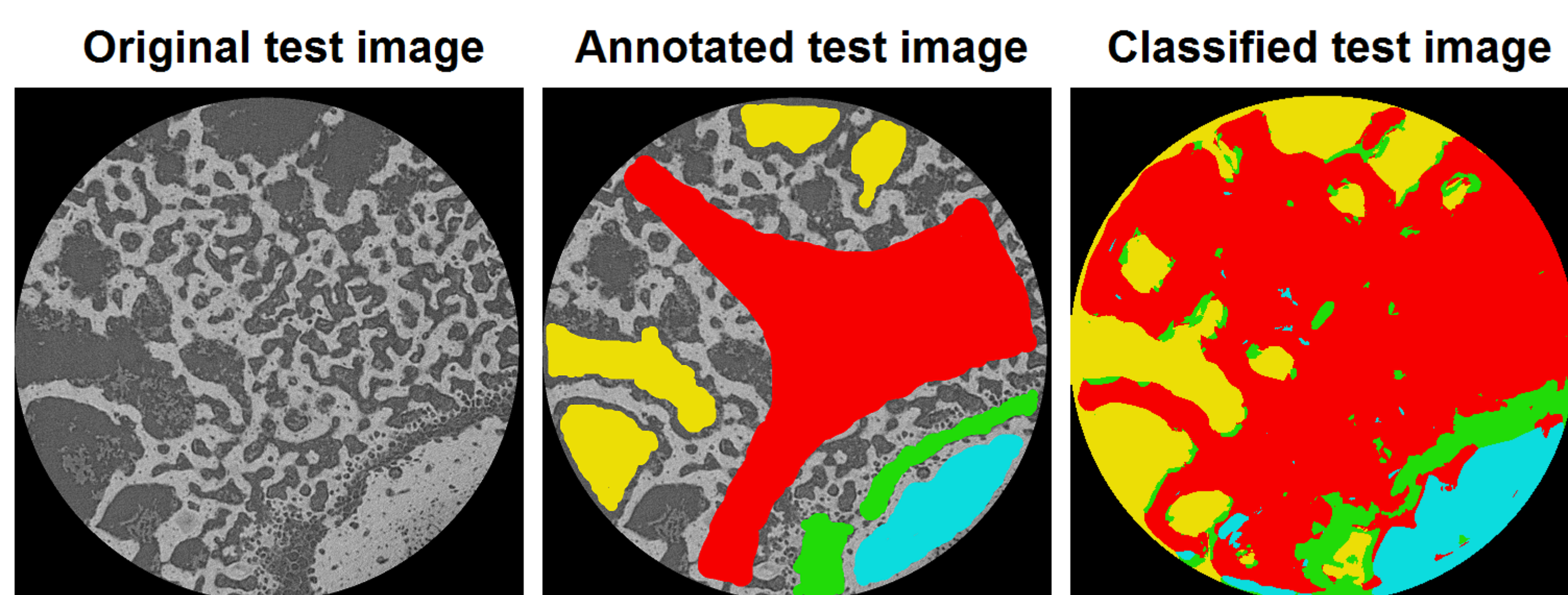
## Finding Growth Plate

To estimate the porosity of the growth plate it is necessary to find the wavy structure of it. This is done using a graph based algorithm. The red line indicates the result of the algorithm.



## Texture Classification

In the growth plate region there is different textures in which the porosity will be estimated. These textures will be classified by using manually annotated images and a feature vector for each pixel describing the intensity and the change in intensity in the neighbouring pixels. Then a KNN classifier is used to classify the different pixels into different texture classes.



## Results

For the Texture Classification the test error is 3.9 % within the annotated areas.

For the Dual Threshold Method the volume, surface area and porosity has been calculated for spongy and compact bone. The results for the spongy bone in the metaphysis are shown for the two most different mice. It indicates that mouse B suffer bone loss. Further analysis of the growth plate and the classified textures will hopefully give the same result.

