Development of a tool for bone mineral density evaluation based on deep learning of lumbar spine X-ray

General Info

Project Abstract

Develop a software for bone mineral density (BMD) assessment from the lumbar spine X-ray images, based on deep learning of the lumbar spine X-ray images with corresponding BMD data.

Background and Motivation

Osteoporosis and osteoporotic fractures have become global health issues of major concern with the growth in the aging population. BMD indicated by Dual-energy X-ray absorptiometry (DXA) is the gold standard for diagnosing osteoporosis recommended by the World Health Organization (WHO). However, DXA is not easily accessible and few people will take DXA check unless there is a high necessity, thus osteoporosis is severely underestimated and undertreated.

Lumbar spine X-ray image is very easily acquired so that most patients may have one. We wish to evaluate BMD with the help of deep learning (or any other artificial intelligence modality suitable) from the common lumbar spine X-ray for osteoporosis screening. We have the lumbar spine X-ray images from a large number of patients. We also have the BMD data indicated by DXA corresponding to each X-ray image.

The software is expected to be installed in the smartphone. One can take a photo of his/her lumbar spine X-ray (antero-posterior position and/or lateral position), import the image directly into the software, and then get the BMD.

Student's Tasks Description

-Find a proper way to segment the vertebrae in the X-ray image (I used to do segmentation of 3D slicer, recommended by somebody else);
-Data processing with proper artificial intelligence method;
-Calculate the data sample number;
-Validate the performance

Technical Prerequisites

References

Check the attachments