Looking for a sweet spot in mammography classification with deep learning

Project Management and Software Development
for Medical Applications

General Info

Contact Person: Mickael Tardy

Contact Email: Mickael.tardy@hera-mi.com

Project Abstract

In this project we are looking for a technique of trainable preprocessing, allowing to maximize the performances of a given classifier. We will focus on mammography imaging and rely on publicly available classifiers.

Background and Motivation

Breast cancer is the most prevalent cancer among women. Mammography is the most common modality dedicated to depicting abnormalities that may be signs of cancer. Computer-aided detection tools are commonly used in clinical practice. Nowadays such tools often rely on deep learning. However, such algorithms are still unstable depending on the rendering of images coming from different vendors. In this work, we will look for a preprocessing technique that allows to maximize the performances on a given dataset.

Student's Tasks Description

In this project, you will build a tool that will process mammography images before handing them to a deep-learning classifier. This preprocessing tool shall modify the mammography image in a way that maximizes the chances that a deep learning classifier [1] generates a correct prediction. You can rely on machine or deep learning techniques in your development. You will

have a chance to discover and operate high-resolution medical imaging [2,3] and explore different machine learning techniques.

Technical Prerequisites

You should be able to write Python code, comfortable with handling Python libraries (e.g., pip, conda) and Python development environment (e.g., PyCharm). Ideally, have some knowledge of image processing techniques and tools (e.g., SimpleITK, scikit-image, openCV).

References

[1] Wu et al. Deep Neural Networks Improve Radiologists' Performance in Breast Cancer Screening https://pubmed.ncbi.nlm.nih.gov/31603772/

[2] Moreira et al. INbreast: toward a full-field digital mammographic database https://pubmed.ncbi.nlm.nih.gov/22078258/

[3] Ha Q. Nguyen et al. "VinDr-CXR: An open dataset of chest X-rays with radiologist's annotations" https://arxiv.org/abs/2012.15029

Please send the completed proposal to ardit.ramadani@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.