



Implementation of a Graphical User Interface for Nuclear Medicine Therapy Dosimetry

Project Management and Software Development
for Medical Applications

General Info

Contact Person: Francesca De Benetti

Contact Email: francesca.de-benetti@tum.de

Project Abstract

The project consists in developing a graphical user interface (GUI) to support the workflow of the dosimetry calculation and evaluation in Nuclear Medicine therapies.

Background and Motivation

Some types of cancers (such as prostate or neuroendocrine tumors) can be treated with the so-called “radionuclide therapy” [1], during which a pharmaceutical with a radioactive component is injected in the body. The main characteristic of the radiopharmaceutical is its ability to target almost only the cancer cells, without damaging healthy cells. The term “dosimetry” refers to the accurate estimation of the effect of radioactivity on the tissue (called “dose”). There are different methods to perform dosimetry, but most of them require a series of SPECT/CT as input and a final interpretation and evaluation of the dosimetric output. Integrating the pipeline in a GUI would help the deployment of such tools in clinical practice.

Student’s Tasks Description

The student will be provided with different types of medical images required to run a dosimetry calculation, plus its output (the dose map). The project consists in developing a GUI that loads the

input images, automatically segments the organs of interest by using available neural networks, loads the dose map and displays quantities (such as the dose per organ) and images (such as the dose-volume histogram (DVH) [2]) to evaluate the result of the dosimetry. The student will have to implement some routines like generating DVHs or isolines from dose maps, and potentially adapt existing software.

Technical Prerequisites

The student should have experience in Python programming. Theoretical and/or practical knowledge of Deep Learning and Pytorch [2] programming is helpful. Experience with Polyaxon [3], Weights & Biases [4] and in GUI programming is beneficial.

References

- [1] <https://www.iaea.org/topics/radionuclide-therapy>
- [2] https://en.wikipedia.org/wiki/Dose-volume_histogram
- [3] <https://pytorch.org>
- [4] <https://polyaxon.com>
- [5] <https://wandb.ai/site>