



Salivary glands segmentation from PET/CT images for Dosimetry applications in Nuclear Medicine

Project Management and Software Development for Medical Applications

General Info

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Project Abstract

Implementation of automatic segmentation for salivary glands in PET/CT volumes, based on state-of-the-art Neural Network architecture.

Background and Motivation

Some types of cancers (such as prostate or neuroendocrine tumors) can be treated with the so-called “radionuclide therapy”, 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. This results in a high level of radiation delivered to the cancer and metastases, and low or no radiation exposure of healthy cells [1]. One of the possible side effects of the radionuclide therapy is the (often temporary) impairment of the salivary glands, which present a non-tumorous uptake of many radiopharmaceuticals. The salivary glands are located in the vicinity of the jaw. Their task is to produce the saliva, which is responsible for many different functions in the human body, such as antimicrobial action, improving the digestion, preserving the mouth and the teeth health [2]. The side effects of radionuclide therapy on salivary glands are one of the reasons why patients refuse to undergo radionuclide therapies. The level of severity of the side effects is related to the amount of radiation delivered to the salivary glands [3], but such evaluation is not commonly carried out in clinical practice because the localization

and segmentation of the salivary glands is a difficult and time consuming task.

Student's Tasks Description

The student task is to generate a dataset for salivary glands segmentation with the help of the Nuclear Medicine department of Klinikum Rechts der Isar. After this preliminary step, the student is asked to train a network (preferably 3D) able to segment the salivary glands. The network should use the information of both the CT and the PET to do the prediction. Collaboration with clinical partners at Klinikum Rechts der Isar is required to fulfill the project.

Technical Prerequisites

The student should have experience in Python programming. Theoretical and/or practical knowledge of Deep Learning and Pytorch [4] programming is helpful. Experience with Polyaxon [5] is beneficial.

References

- [1] <https://www.iaea.org/topics/radionuclide-therapy>
- [2] https://en.wikipedia.org/wiki/Salivary_gland#Function
- [3] <https://inm.snmjournals.org/content/inumed/60/4/517.full.pdf>
- [4] <https://pytorch.org>
- [5] <https://polyaxon.com>