USZ Universitäts Spital Zürich

Klinik für Radio-Onkologie

Universitätsspital Zürich, Rämistrasse 100, 8091 Zürich

Prof. Dr. Jan Unkelbach
Medical physics research

Department of radiation oncology
Universitätsspital Zürich
Rämistrasse 100
8091 Zürich

jan.unkelbach@usz.ch

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PhD position available in
Medical Physics in Radiation Therapy

Topic:

Statistical machine learning models of lymphatic cancer progression

Over the past 20-30 years, research in medical physics has provided tremendous improvements to the technology used to deliver radiotherapy for treating cancer. This includes the development of intensity-modulated radiotherapy with x-rays (IMRT) and protons (IMPT), which allows us to deliver radiation precisely to tumors and spare adjacent healthy tissues from radiation. With these technological improvements in precision, the biggest source of uncertainty today is often the definition of the target volume, i.e. the region to be irradiated. Many tumors spread through the lymphatic system and form metastases in regional lymph nodes. In many patients, a large part of the lymph drainage system is irradiated since it is uncertain how far the tumor has already spread.

In this project, we work on statistical machine learning models, mainly Bayesian networks and Hidden markov models, to describe the spread of cancer through the lymphatic system. The goal of the model is to estimate the probability that different parts of the lymph drainage system are already infiltrated by the tumor, depending on the location of the primary tumor and other risk factors. This may lead to improved definition of the target volume and reduced side effects of radiotherapy.

We are looking for a PhD candidate with a strong background in physics, computer science, applied mathematics, engineering, or a related field. Applicants should have a genuine interest in applying computational techniques to solve applied problems in medicine. Experience and interest in scientific programming is mandatory; prior knowledge in statistics, machine learning, medical image processing, medical imaging, or radiotherapy is beneficial.

The PhD candidate will be enrolled at the science faculty at the University of Zürich (UZH) and will work in the radiation oncology department at the University Hospital (USZ). Zürich offers an attractive environment for medical physics research with diverse research groups at USZ, UZH and ETH including the Institute for Biomedical Engineering and the medical computer vision lab.

Further information on the project can be found on our website:
https://www.physik.uzh.ch/en/groups/unkelbach/Research/Targetdefinition.html

Please contact Prof. Jan Unkelbach to apply or to obtain further information.