USZ Universitäts Spital Zürich

Klinik für Radio-Onkologie

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Medical physics research

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PhD position available in Medical Physics in Radiation Therapy

Topic:

Temporal optimization of radiation therapy

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 (IMRT) and image-guided radiotherapy (IGRT), which allows us to deliver radiation precisely to tumors and spare adjacent healthy tissues from radiation. These developments have mainly focused on improving the spatial precision of radiotherapy. In contrast, the temporal aspect, the question how radiotherapy is optimally delivered over time has attracted much less research attention. Typically, patients are irradiated over several days or weeks in equal daily fractions, i.e. the same dose is delivered on each treatment day.

In our group we work on ideas to improve radiation treatments by delivering different doses on different days. This may be motivated by motion of the tumor from day to day, which led to the idea of adaptive fractionation - aiming at delivering higher doses on days when the tumor is further away from radiosensitive organs, and lower doses if they are close. Biological aspects provide another motivation. This led to the idea of spatiotemporal fractionation, which aims at treating different parts of the tumor on different days while splitting the dose evenly in the surrounding healthy tissues.

The goal of the PhD thesis is to develop these ideas further and contribute to a translation into clinical trials. In parallel, new ideas in the domain of temporal optimization of radiotherapy may be explored. 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 mathematical methods to practical problems in medicine. Experience and interest in scientific programming is mandatory; knowledge in medical physics, radiotherapy, or mathematical optimization 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.

Further information on our research can be found on our website:
https://www.physik.uzh.ch/en/groups/unkelbach/Research/Spatiotemporal.html
https://www.physik.uzh.ch/en/groups/unkelbach/Research/MR-Linac.html

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