



IRENE – CD Laboratory for Image and Knowledge Driven Precision Radiation Oncology

In the frame of the Christian Doppler Laboratory of Image and Knowledge Driven Precision Radiation Oncology (IRENE) at the Department of Radiation Oncology we are offering **4 PhD and one study assistance position**. Through enrolment in a three-year PhD program (N094) at the Medical University of Vienna, Austria, all students will work together on innovative projects within a peer group and will receive broad training in for a career in academia, industry and beyond.

The **CD laboratory IRENE** aims to improve cancer care by increasing the precision of radiation oncology by integrating two major pillars in contemporary personalized medicine: Technological improvement will be combined with modern radiobiology-driven adaptive treatment concepts together with innovative forms of prospective automatized data collection and outcome assessment.

Research team and infrastructure

Located in Vienna, the most livable city in the world, the Department of Radiation Oncology at the Medical University of Vienna is a high-end equipped photon and brachytherapy department where cutting edge research meets excellent oncological care. The interdisciplinary team in this project is put together by medical doctors, the medical radiation physics group and the large group of RTTs and study assistance.

What We Offer

- A highly interdisciplinary and collaborative work environment.
- Access to state-of-the-art facilities and technologies
- Strong collaboration with the industrial partners Elekta, Brainlab and Philips
- Strong collaboration and network between the interdisciplinary projects
- Enrolment in the Doctoral PhD program N094 at the Medical University of Vienna
- **Funding that covers all research costs, work – related travel expenses, salary and health insurance for 3.5 years**

What We Expect

- Analytical skills and ability to work independently on a project basis
- Good written and verbal communication skills
- Fluent in English (oral and written)

General project and contact information

- Start of project: 01.01.2024
- Place of work: Department of Radiation Oncology, Medical University of Vienna, Vienna
- Salary: 30 hours/week (according to salary scheme of the Austrian science fund FWF - <https://www.fwf.ac.at/en/research-funding/personnel-costs>)
- Closing date for application: 19.11.2023

All detailed information on the open positions can be found on our homepage:

https://radioonkologie.meduniwien.ac.at/fileadmin/content/OE/radioonkologie/dokumente/Abschlussarbeiten/CDL_Vacancies.pdf

Please submit your application including a CV and motivation letter to Barbara Knäusl (barbara.knaeusl@meduniwien.ac.at) and Maximilian Schmid (maximilian.a.schmid@meduniwien.ac.at)



The employer does not discriminate on the grounds of race, colour, religion, sex, sexual orientation, including transgender status and gender expression, national origin, citizenship status, age or disability.

Disabled candidates are preferentially considered in case of equal qualification. Applications from women are encouraged.



Project 1 – PhD Position on the Clinical Implementation of Online Tumor Tracking in Radiation Oncology

About the Project

The aim of this project is the clinical implementation of time-resolved imaging techniques visualizing internal and external motion used for tumor tracking. By combining surface and X-ray based imaging with treatment delivery records we aim to improve the accuracy of dose delivery, assessment and accumulation.

The goal is to develop an efficient and streamlined patient workflow including internal-external tumor motion monitoring and motion prediction to pave the way for real-time adapted dose delivery. The correlation of improved dose simulation based on time-resolved image information with patient reported outcome measures (PROMs) will increase the accuracy of outcome models.

In this project we offer the opportunity to work on the implementation of cutting-edge technologies for the treatment of lung cancer.

Key Responsibilities

1. Workflow implementation

- Develop workflow for real-time tumor tracking in close collaboration with other PhD projects and with company partners.
- Dosimetric validation of envisaged clinical workflows in end-to-end test procedures.

2. Clinical study supervision

- Involvement in writing ethics applications and close collaboration with medical team
- Supervision and on-site support of clinical studies together with the clinical study office

3. Data collection and analysis:

- Collecting all treatment related data and patient reported outcome measures in cooperation with other PhD projects.
- Combination of all time-resolved imaging data with treatment delivery records to simulate the administered dose considering the 4D position of the tumor.

Qualifications

- Master's degree or equivalent in (Medical) Physics, Biomedical Engineering (with Physics background) or a related field.
- Strong interest in workflow development, concept design and automatization, basic to medium Python programming skills
- Background in dosimetry, image analysis and processing, medical physics and radiation oncology is an asset



Project 2 – PhD Position on Real-time Internal/External Tumor Motion Assessment in Radiation Oncology

About the Project

In radiation oncology tumour motion monitoring is required to reduce uncertainty in tumor position, especially for tumours subjected to respiratory motion. The aim of this project is to use the combination of internal X-ray based imaging with surface imaging as external motion surrogate with high temporal resolution for clinical motion monitoring. This requires the establishment of a motion correlation and prediction model tailored to the clinical environment.

The goal is to use the developed models using patient data as preparation for the implementation of real-time motion prediction. To assure a safe and highly accurate dose delivery, a framework for logfile based dose reconstruction in combination with inter- and intrafractional image information will be developed.

In this project we offer the opportunity to be part of a complex software development and integration project improving cancer care.

Key Responsibilities

1. Code development

- Development of correlation and prediction models for real-time X-ray and surface patient imaging data to overcome system inherent latencies.
- Incorporation of correlation and prediction models into an existing in-house developed software.

2. System integration

- Establishing and testing all interfaces (linac and imaging) for real-time data transfer
- Streamline log-file based dose reconstruction based on inter- and intrafractional image information.

3. Data analysis and validation

- Analysis of clinically acquired 4D-CT, surface and X-ray images to establish the internal/external position correlation model.
- Correlation of real-time imaging information with treatment record data in close collaboration with other PhD projects.

Qualifications

- Master's degree or equivalent in Physics, Medical Informatic, Data Science or a related field
- Strong programming skills, especially in Python and C++, understanding of data processing and analysis.
- Background in image-based motion assessment and radiation oncology workflows and machine learning is an asset.



Project 3 – PhD position on MRI based adaptive radiation oncology

About the Project

This research project will focus on the use of MRI in radiotherapy of head&neck and uterine cervical cancers for guidance of individual treatment adaptations. Major emphasis will be put on the assessment of treatment response, image analysis and outcome prediction. The project will be divided in 3 phases starting with MRI protocol development and a simulation study. In the simulation study repetitive MRI will be performed within the course of chemoradiation. Tumor response will be analysed and the dosimetric impact on radiotherapy evaluated. Based on the results of the simulation study an adaptive target volume concept will be developed, which will be explored within a subsequent prospective clinical phase II trial.

In this project we offer the opportunity to implement novel treatment concepts into the clinic and be an active member of the internationally renowned EMBRACE research group.

Key Responsibilities

1. Protocol development

- MRI image sequence optimization for adaptive radiotherapy in head&neck and uterine cervical cancer.
- Development of an adaptive target volume concept for MR-guided adaptive radiotherapy of head&neck cancer.

2. Clinical studies

- Interdisciplinary collaboration with radiation oncology, radiology and medical physics.
- Organisation, support and supervision of the implementation of the clinical studies including patient monitoring.

3. Data analysis and validation

- Analysis and processing of longitudinal MRI data
- Radiotherapy treatment plan comparison

Qualifications

- MD or MSc or equivalent degree in human medicine, biomedical engineering, physics, medical informatics or other technology-oriented medical studies.
- Research interest for MRI in radiation oncology, image-guided adaptive radiotherapy for head&neck cancer and uterine cervical cancer, qualitative and quantitative image processing and analysis.
- Skills in data management and basic statistical methods required, basic knowledge in radiation oncology and radiology recommended, experience in image analysis and processing preferred.



Project 4 - PhD Position on Medical Data Science in Radiation Oncology

About the Project

The project aims to establish a transformative “Big Data Clinic” within the field of Radiation Oncology. The focus is on the integration of patient-reported outcomes measures (PROMs) and physician-reported outcomes into daily clinical care. This comprehensive dataset will be combined with radiotherapy treatment data to create a streamlined, object-oriented data architecture.

The goal is to implement a Learning Healthcare System (LHS) that can feed directly into AI-assisted clinical decision tools. This will facilitate real-time adaptation of treatment protocols, thereby improving patient outcomes.

In this project we offer the opportunity to work at the intersection of radiation oncology, data science, and artificial intelligence.

Key Responsibilities

1. Data Architecture Development:

- Establish a patient-centric data warehouse that combines clinical, imaging, and treatment data into a unified framework.
- Collaborate closely with other ongoing PhD projects, offering numerous opportunities for interdisciplinary research.

2. Case Study Implementation:

- Utilize the developed data architecture to implement a Learning Healthcare System.
- Initial focus will be on patients with breast cancer and head/neck malignancies.

3. Monitoring and Analysis:

- Develop tools to monitor, detect, and interpret changes in treatment outcomes.
- Utilize data analytics to optimize the Learning Healthcare System's performance.

Qualifications

- Master's degree or equivalent in Physics, Computer Science, Data Analysis, or a related field.
- Strong programming skills, especially in Python, Javascript, and SQL.
- A background in medical physics, radiation oncology, or a related medical field is a plus but not mandatory.

Study assistance

As study assistance, you are part of an interdisciplinary team at the Department of Radiation Oncology of the Medical University of Vienna consisting of radiation oncologists, physicists and PhD students. Your job will include administration of local and international studies, study documentation, project management, coordination of study participants, assessment of questionnaires (patient-reported outcome measures – PROMS) and patient data.

Key Responsibilities

- Study administration and documentation
- Patient Communication
- Clinical data management
- Administrative support of CD laboratory heads

Working time and salary

- Start of project: 01.01.2024
- Place of work: Department of Radiation Oncology, Medical University of Vienna, Vienna
- Salary: 30 hours, salary level IIIa according to the law of the Austrian universities
- Closing date for application: 19.11.2023

Qualifications

- Matura or equivalent qualification
- Good communication skills (**german** and english) relevant for working in an international research and study group.
- Basic computer skills
- Previous experience in project management and study documentation preferred.
- Previous experience in health-care related work preferred.

Please submit your application including a CV and motivation letter to Barbara Knäusl (barbara.knaeusl@meduniwien.ac.at) and Maximilian Schmid (maximilian.a.schmid@meduniwien.ac.at)