Supervisors within the doctoral studies at the MUV

Name of supervisor (LAST NAME, First name):

GEORG, Dietmar

Organizational unit and subunit:

Department of Radiation Oncology, Medical University Vienna

Studies (N090, N094, N790): N094

Thematic Program: Medical Imaging

Funding source for students to be supervised: FWF and CDG (see below)

Third-party funding (select a max. of 5 starting with the most recent)

<table>
<thead>
<tr>
<th>Period</th>
<th>Organization (eg. FWF)</th>
<th>Short title</th>
<th>€/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013 – 2016</td>
<td>FWF</td>
<td>Treatment planning and evaluation system for brachytherapy of uveal melanoma</td>
<td>ca. 91.000 (tot. 274.884 €)</td>
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<tr>
<td>2012 – 2016</td>
<td>Christian-Doppler Gesellschaft</td>
<td>Medical Radiation Research for Radiation Oncology</td>
<td>600.000 (tot. 3 Mio€)</td>
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</tbody>
</table>

Local, national and international co-operations (select a max. of 5 starting with the most recent)

<table>
<thead>
<tr>
<th>Name (Last-, Firstname)</th>
<th>Title of project</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAYER Ramona (MAUS)</td>
<td>Image Guided and Adaptive Ion Beam Therapy</td>
</tr>
<tr>
<td>HELBICH Thomas (Med. Uni Wien)</td>
<td>Response assessment / Multimodality Imaging</td>
</tr>
<tr>
<td>BIRKFELLNER Wolfgang (Med. Uni Wien)</td>
<td>Image Guided Radiotherapy – Technology development</td>
</tr>
<tr>
<td>HAUG Alexander (Med. Uni Wien)</td>
<td>PET for target delineation and response assessment in Radiation Oncology</td>
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</table>

Current doctoral students

<table>
<thead>
<tr>
<th>Name (Last-, Firstname)</th>
<th>Title of project</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANDRZEJEWSKI Piotr</td>
<td>Development and validation of a semi-automated tool for tumour detection and delineation based on multimodal images</td>
</tr>
</tbody>
</table>
FUCHS Hermann | Modelling dose distributions for Helium Ion beam therapy
GORA Joanna | Adaptive radiotherapy and treatment planning for ion beam therapy

Former doctoral students (select a max. of 5 starting with the most recent)

<table>
<thead>
<tr>
<th>Name (Last-, Firstname)</th>
<th>Title of the doctoral thesis</th>
</tr>
</thead>
<tbody>
<tr>
<td>LECHNER Wolfgang</td>
<td>Dosimetric evaluation of flattening filter free photon beams</td>
</tr>
<tr>
<td>KUESS Peter</td>
<td>Automated analysis of PET based in-vivo monitoring in ion beam therapy</td>
</tr>
<tr>
<td>KNÄUSL Barbara</td>
<td>PET based biologically adapted radiotherapy – implementation and validation of treatment planning approaches</td>
</tr>
<tr>
<td>FOTINA Irina</td>
<td>Physical and clinical aspects of image-guided adaptive radiotherapy</td>
</tr>
<tr>
<td>KRAGL Gabriele</td>
<td>New technological approaches in photon beam production, delivery and planning – volumetric intensity modulated arc therapy and Flattening filter free photon beams</td>
</tr>
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</table>

Other supervisions (select a max. of 5 starting with the most recent)

<table>
<thead>
<tr>
<th>Name (Last-, Firstname)</th>
<th>Kind of Supervision</th>
</tr>
</thead>
<tbody>
<tr>
<td>DREINDL Ralf</td>
<td>MSc thesis: Medical Physics aspects of hybrid arc and rotational IMRT</td>
</tr>
<tr>
<td>LECHNER Wolfgang</td>
<td>MSc thesis: Static and rotational IMRT with flattening filter free photon beams</td>
</tr>
<tr>
<td>RAUSCH Ivo</td>
<td>MSc thesis: &quot;Investigation of the characteristics of reconstruction algorithms in positron emission tomography</td>
</tr>
<tr>
<td>STEININGER Wolfgang</td>
<td>MSc thesis: Feasibility of CBCT based dose recalculation: comparative analysis of HU adjustment techniques</td>
</tr>
<tr>
<td>STEINER Elisabeth</td>
<td>MSc thesis: Image-Guided Radiotherapy of prostate cancer: organ and patient movement analysis</td>
</tr>
</tbody>
</table>

Publications with trained and supervised individuals as listed above as first-authors (reference all authors and provide the exact citation; e.g.: O'Connor V, El Far O, Bofill-Cardona E, Nanoff C, Freissmuth M, Karschin A, Airas JM, Betz H, Boehm S. Science. 1999 Nov 5;286(5442):1180-4.)


Headline and description of the planned project:

MR guided radiotherapy

With intensity modulated radiotherapy (IMRT) the high dose volume can (almost) be perfectly matched to the tumor. Nevertheless, for target volume delineating in clinical routine CT remains the most widely used modality. Ideally highly conformal dose distributions are based on high-resolution imaging. The major advantages of MRI over CT are basically superior contrast resolution and better soft tissue differentiation, lack of exposure with ionizing radiation, flexibility and easy combination of anatomic and function imaging. In this context also smaller inter- and intra-observer variations need to be considered when using MRI for structure segmentation.

In contrast to brachytherapy, where MR guided brachytherapy can be considered as the standard of care for treating cervical cancer, there is not consensus on how ideally an MR Scanner is integrated and adopted for external beam therapy despite the above listed benefits when using an MR for radiotherapy treatment planning. In the framework of this project methods will be explored and clinically validated to construct a synthetic CT image from MR data. When a pragmatic approach is followed to use existing MR scanner technology for external beam radiotherapy treatment planning and to convert MR into synthetic CT data for dose calculation, some more technical issues need to be solved, such as to integrate a flat table top on the MR for patient scanning in treatment position, the use and/or development of coils large enough to cover both the patient and the immobilization devices, scanner software corrections for geometric distortion, and finally regular quality assurance for the needs of radiation oncology are to be developed. All these items will be addressed in this project.

Image Guided and Adaptive Radiotherapy for Cervix cancer

With the introduction of cone-beam CT (CBCT) scanners that are mounted directly at the linear accelerator, it became possible to observe anatomic changes of internal organ configurations for each treatment fraction and, theoretically, to re-adaptation of treatment plans according to changes in organs at risk (OAR) morphology (e.g. due to filling), resulting in further reduction of the toxicity. Full online plan adaptation requires that re-delineation, re-optimizing of dose distributions and repetition of all legally required quality assurance steps should be performed in a few minutes. Unfortunately, this is currently not yet possible. However, it is possible to apply a simplified scheme of adaptation that has a good balance between accuracy and workload.

Based on our own experience and that of other research groups, cervix cancer patients can be divided into two groups: The first group consists of patients who show uterus motion as a function of bladder filling (called “Movers”) and the second group are those patients whose uterus position stays relatively stable regardless of bladder volume (“Non-Movers”). With a model for the uterus position, a pre-
determined set of plans can be constructed for the “Movers”, and the most appropriate treatment plan can be selected on a daily basis, while for the “Non-Movers” a single plan will be sufficient.

We propose a clinical pilot study in which adaptation of the external beam radiotherapy will be performed through adaptive radiotherapy (ART) based on a uterus motion model as a function of bladder filling. In its first phase the project aims are technology development for image guided adaptive radiotherapy, its clinical testing and validation, and finally the clinical implementation. In the second step the effectiveness of this technique and the reduction of dose to the surrounding health tissue will be assessed, early side effects will be prospectively recorded at pre-established intervals in a detailed, well-structured way.
# Curriculum Vitae

**Name:** Dietmar GEORG  
**Address:** Schindlergasse 21/7, 1180 Wien

## Personal Data
- **Date of Birth:** 22.09.1968  
- **Place of Birth:** Braunau am Inn  
- **Nationality:** Austria

## Education
- **1995 - 1997**  
  - Doctoral Studies, Dr. Sc. degree, Vienna University of Technology, Thesis: ‘The mini-phantom concept applied to a new type of multileaf collimator’, doctoral study passed with distinction.
- **1989 – 1995**  
- **1983 – 1988**  
  - Technical College for Electrical Engineering, including vocational training and qualifying for university entrance (HTL Braunau am Inn, Austria), final examination passed with distinction

## Career History
- **2014**  
  - Full professorship in Medical Radiation Physics and Oncotechnology, Medical Univ. Vienna
- **2001**  
  - Habilitation in Medical Physics 2001; Appointment as Assoc. Prof. and Head of the Division of Medical Radiation Physics, Department of Radiation Oncology, Medical Univ. Vienna
- **Since 1999**  
  - Department of Radiation Oncology, Medical University Vienna
- **1997 – 1999**  
  - Post-doc at KU-Leuven, Dept. of Radiotherapy

## List of publications:

**Accepted in international peer-reviewed Journals**


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*... impact factor of the respective year*
and Markov random fields, *In press EJNMMI Physics*


104.


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<thead>
<tr>
<th>Number</th>
<th>Author(s)</th>
<th>Title</th>
<th>Journal</th>
<th>Volume/Issue</th>
<th>Pages</th>
</tr>
</thead>
</table>


