Martin J. Menten, PhD

Curriculum vitae

The Institute of Cancer Research
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Physicist with over six years of research experience at world-leading cancer research institutes. Investigated novel strategies and developed automated systems to monitor and compensate for tumor motion during external beam radiotherapy. Adept at solving applied problems using a variety of skills in physics, computer science, math and statistics.

Education and professional development

since 2019 **Postdoctoral research fellow**, *The Institute of Cancer Research*, London, UK.
- Analyzed clinical images and machine log files from the world's first medical linear accelerator with integrated high-field magnetic resonance imaging.
- Managed and contributed to multi-institutional research collaborations.

2014–2018 **PhD student**, *The Institute of Cancer Research*, London, UK.
- Researched, implemented and evaluated novel strategies to adapt external beam radiotherapy to anatomical changes in real-time, increasing cure rates and reducing side effects of treatment.
- Developed techniques to acquire and post-process magnetic resonance images to automatically localize tumors and healthy organs during radiotherapy.
- Programmed software to interface with clinical linear accelerators and magnetic resonance scanners, facilitating real-time control of the machines.
- Worked with industrial partners to debug and improve clinical and research oncology software.
- Disseminated research output via peer-reviewed papers, conference presentations, professional newsletters and at public outreach events.

2011–2014 **Master of Science in physics**, *Heidelberg University*, Germany.
- Research for Master's thesis conducted at the Institute of Cancer Research, London.
- Developed a comprehensive Monte Carlo simulation of an x-ray imaging system and associated physical processes, including the x-ray tube, patient geometry and flat panel detector.
- Optimized energy and filtration of x-ray imaging beam to improve lung tumor visibility in chest radiographs.

2012–2013 **Research intern**, *University of Wisconsin-Madison*, USA.
- Six-month research internship with the Department of Medical Physics.
- Developed an algorithm to automatically localize biopsy needles based on optical imaging.

2008–2011 **Bachelor of Science in physics**, *Heidelberg University*, Germany.
- Bachelor's thesis project completed at the German Cancer Research Center, Heidelberg.
- Experimentally compared the ability of two robotic radiotherapy systems to adapt dose delivery to varying patient anatomies in real-time.

Awards and honors

- Paper selected as editor's pick for the ESTRO newsletter May-June, 2016.
- ESTRO 35 conference submission highlighted in the congress report, 2016.
- Fully funded PhD scholarship (£150,000) at the Institute of Cancer Research, 2014-2018.
- Young investigator award (€500) of the Electronic Patient Imaging conference, 2014.
- PROMOS scholarship from the German Academic Exchange Service (€900) to support a six-month research stay at the University of Wisconsin-Madison, 2012-2013.

Skills

Programming

- 5 years of experience developing and maintaining software in C++ (Monte Carlo simulations and software controlling medical devices and interfacing with clinical radiation oncology systems), Python and MATLAB (image post-processing as well as statistical analysis and visualization of results).
- Extensive experience using an array of toolkits and libraries including Geant4 (Monte Carlo simulation), dcmtk (medical image handling), OpenCV (image processing), Qt (GUI design), OpenMP (software parallelization), ROOT, NumPy, SciPy, pandas (all data analysis), scikit-learn (machine learning), Keras and TensorFlow (both deep learning).

Scientific

- Systematic approach to solving problems using a large variety of skills in physics, computer science, advanced math and statistics.
- Expert knowledge in medical physics and radiation oncology fueling the generation of novel hypotheses at the cutting edge of cancer research.
- Design and execution of computer simulations and experiments using medical imaging and treatment devices, such as linear accelerators, x-ray and magnetic resonance scanners.
- Collaborated in a multi-disciplinary team consisting of physicists, computer scientists, statisticians, medical doctors and radiotherapy technical staff.
- Presentation of research results to diverse audiences. Twelve peer-reviewed journal articles with 140 citations in total, mostly published in the premier academic journals in radiation oncology and medical physics. Multiple presentations and invited talks at international conferences. Full list is attached below.
- Referee for several leading radiation oncology and medical physics journals (International Journal of Radiation Oncology*Biology*Physics, Radiotherapy and Oncology, Medical Physics, Physica Medica, British Journal of Radiotherapy, Physics and Imaging in Radiation Oncology, Advances in Radiation Oncology, Radiation Oncology and International Journal of Computer Assisted Radiology and Surgery).

Languages

- German (fluent)
- English (fluent)

Publications

Peer-reviewed journal articles

- M. J. Menten, M. F. Fast, A. Wetscherek, C. M. Rank, M. Kachelrieß, D. J. Collins, S. Nill, and U. Oelfke. The impact of 2D cine MR imaging parameters on automated tumor and organ localization for MR-guided real-time adaptive radiotherapy. *Physics in Medicine and Biology*, 63(23):235005, 2018.
- J. P. Kieselmann, C. P. Kamerling, N. Burgos, M. J. Menten, C. D. Fuller, S. Nill, M. J. Cardoso, and U. Oelfke. Geometric and dosimetric evaluations of atlas-based segmentation methods of MR images in the head and neck region. *Physics in Medicine and Biology*, 63(14):145007, 2018.

- B. Eiben, E. H. Tran, M. J. Menten, U. Oelfke, D. J. Hawkes, and J. R. McClelland. Statistical Motion Mask and Sliding Registration. *Proceedings of the International Workshop on Biomedical Image Registration*, pages 13–23, 2018.
- M. F. Fast, B. Eiben, M. J. Menten, A. Wetscherek, D. J. Hawkes, J. R. McClelland, and U. Oelfke. Tumour auto-contouring on 2d cine MRI for locally advanced lung cancer: A comparative study. *Radiotherapy and Oncology*, 125(3):485–491, 2017.
- M. J. Menten, A. Wetscherek, and M. F. Fast. MRI-guided lung SBRT: present and future developments. *Physica Medica*, 44:139–149, 2017.
- H. E. Bainbridge, M. J. Menten, M. F. Fast, S. Nill, U. Oelfke, and F. McDonald. Treating locally advanced lung cancer with a 1.5 T MR-Linac–Effects of the magnetic field and irradiation geometry on conventionally fractionated and isotoxic dose-escalated radiotherapy. *Radiotherapy and Oncology*, 125(2):280–285, 2017.
- C. P. Kamerling, M. F. Fast, P. Ziegenhein, M. J. Menten, S. Nill, and U. Oelfke. Real-time 4D dose reconstruction for tracked dynamic MLC deliveries for lung SBRT. *Medical Physics*, 43(11):6072–6081, 2016.
- M. J. Menten, M. F. Fast, S. Nill, C. P. Kamerling, F. McDonald, and U. Oelfke. Lung stereotactic body radiotherapy with an MR-linac–Quantifying the impact of the magnetic field and real-time tumor tracking. *Radiotherapy and Oncology*, 119(3):461–466, 2016.
- M. Fast, C. Kamerling, P. Ziegenhein, M. Menten, J. Bedford, S. Nill, and U. Oelfke. Assessment of MLC tracking performance during hypofractionated prostate radiotherapy using real-time dose reconstruction. *Physics in Medicine and Biology*, 61(4):1546, 2016.
- M. J. Menten, M. F. Fast, S. Nill, and U. Oelfke. Using dual-energy x-ray imaging to enhance automated lung tumor tracking during real-time adaptive radiotherapy. *Medical Physics*, 42(12):6987–6998, 2015.
- M. J. Menten, M. Guckenberger, C. Herrmann, A. Krauß, S. Nill, U. Oelfke, and J. Wilbert. Comparison of a multileaf collimator tracking system and a robotic treatment couch tracking system for organ motion compensation during radiotherapy. *Medical Physics*, 39(11):7032–7041, 2012.

Oral presentations at conferences

- Dosimetric Benefit of Using Real-Time Multileaf Collimator Tracking to Compensate for Intrafractional Lung Tumor Deformations. Presented at the AAPM 60th Annual Meeting and Exhibition, 2018.
- Managing motion with 4D imaging. Invited presentation at the UK Radiological and Radiation Oncology Congress, 2018.
- How should we acquire 2D cine MR images to determine lung tumor shifts perpendicular to treatment beam direction? Presented at 5th MRinRT symposium, 2017.
- The effects of a magnetic field and real-time tumor tracking on lung stereotactic body radiotherapy. Presented at the ESTRO 35 conference, 2016.
- Radiotherapy physics modeling using Monte Carlo methods at the ICR - dose calculation for the MR-linac and more. Invited presentation at the MCNEG meeting, 2016.

- Target Dose Comparison for Dynamic MLC Tracking and Mid-Ventilation Planning in Lung Radiotherapy Subject to Intrafractional Baseline Drifts. Presented at the AAPM 58th Annual Meeting and Exhibition, 2016.
- Validation of the accuracy of a novel online dose reconstruction method using linac log files. Presented at the International Conference on the use of Computers in Radiation Therapy, 2016.
- Enhancement of Lung Tumor Visibility by Dual-Energy X-Ray Imaging in An Anthropomorphic Chest Phantom Study. Presented at the AAPM 56th Annual Meeting and Exhibition, 2014.
- Using Dual-Energy X-Ray Imaging to Improve Automated Lung Tumor Tracking. Presented at the EPI meeting, 2014.
- Comparison of a MLC and a HexaPod tracking system for organ motion compensation during radiotherapy. Presented at the ESTRO 32 conference, 2012.

Theses

- Harnessing magnetic resonance imaging for real-time adaptive radiotherapy, PhD thesis conducted in the Radiotherapy Physics Modeling group of Professor Uwe Oelfke at the Institute of Cancer Research, London, UK, 2018.
- Using dual-energy x-ray imaging to enhance automated lung tumor tracking during real-time adapted radiotherapy, Master's thesis conducted under the supervision of Professor Uwe Oelfke at the Institute of Cancer Research, London, UK, 2014.
- Comparison of a multileaf collimator and a robotic treatment couch for organ motion compensation during radiotherapy, Bachelor's thesis supervised by Professor Uwe Oelfke at the German Cancer Research Center, Heidelberg, Germany, 2011.