3rd ESTRO Physics Workshop: Science in Development

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Implementation, Commissioning and Quality Assurance of Artificial Intelligence techniques track

Chairs:

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Around 30 participants gathered together in Budapest for a timely workshop on the use of artificial intelligence (AI) techniques in radiotherapy. The first day of the programme consisted of two keynote lectures by invited speakers. Between the invited talks there were short pitches from the participants to inform each other of their specific projects or to offer ideas on ways to implement artificial intelligence techniques in research or routine clinical practice.

The first keynote lecture was given by Mats Holmström who is working at RaySearch as a senior machine-learning engineer. The team he works in is responsible for the development and introduction of deep-learning-based automatic planning. He presented the various steps necessary for implementation of such planning in routine clinical practice, from initial design and selection of the architecture through the training and commissioning steps to collaboration with the clinical experts at the hospital. This presentation was a nice introduction to an inspiring day of discussions.

After the first session, various pitches were given on a variety of topics. Many participants in their day-to-day work were actively pursuing the use of deep-learning-based methods for automatic segmentation, both for the organs-at-risk and for tumour delineation. Furthermore, participants explained that the source of information being used as input had extended from CT scans to the consideration of MRI sequences. Other pitches discussed the generation of synthetic CT images based on MRI imaging, or the use of machine learning for quality assurance and control.

The second keynote lecture was provided by Charlotte Brouwer, a medical physicist from Groningen (The Netherlands) who was responsible for the clinical introduction of a deep-learning-based auto-segmentation system. She took us through the commissioning and selection of appropriate training data to acceptance testing and validation of clinical use. Discussion between the participants focused on the clinical acceptability and adoption of these algorithms in clinical practice.

After the first day, the participants were placed in two groups to discuss four major themes that needed to be addressed before these new techniques could be added to clinical practice:

1) training and development;
2) commissioning and quality assurance;
3) clinical implementation and daily practical use, and;
4) data protection issues and the sharing of AI models.

The outcome of all these discussions was that there remained work to be done on education and familiarisation of these new AI concepts in the context of radiotherapy. One of the future steps will be to write a review or educational paper on the use of artificial intelligence techniques in radiotherapy. A second idea was to survey radiotherapy centres to draw up inventories of the currently applied AI techniques and the barriers and needs for clinics to start implementation of these techniques. After 1.5 days of exciting discussions, new ideas and future plans the participants all left with their minds full of thoughts for the future. I would like to thank all participants for their active discussions and the positive atmosphere that they generated.

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