3rd ESTRO Physics workshop: Science in development
25-26 October 2019, Budapest, Hungary

Implementation/commissioning/QA of artificial intelligence techniques

Chairs: Wouter van Elmpt & Dirk Verellen

Motivation:

Artificial intelligence (AI) techniques such as advanced machine learning and deep learning are currently finding their way into clinical routine practices. There is still an open question on how properly design, validate and commissioning these algorithms. AI sometimes present as 'black box' algorithms and the results may not always be deterministic or predictable upfront due to the large number of degrees of freedom that these algorithms have.

In this workshop we will discuss the principles how to design, validate and implement such algorithms from various perspectives. A) Developer/researcher perspective: what are the possibilities, problems and pitfalls in designing such algorithms and how to quantify their accuracies. B) The (clinical) end-user on how to validate (commission) the output of such techniques for use in clinical practice.

We welcome contributions from the community (both developers as well as users) working with AI that have a focus on radiotherapy or medical imaging: e.g. pseudo CT reconstruction from MRI only imaging, automatic segmentation using deep-learning techniques, automatic dose distribution predicting, image registration, noise reduction in medical imaging; subjects are not limited to these topics but just serve as example.

This being a workshop we want to encourage an active participation and interaction between the participants to foster collaboration and networking. For that reason, participants will be requested to prepare a short presentation (a pitch) to present their research in the field allowing identification of common points of interests and share experiences.

Outcome:

Guideline on how to design, validate and implement machine learning algorithms for clinical use.

Day 1	**Friday 25 October**
08:00	Registration opens
09:00-09:15	Introduction of the meeting: **Núria Jornet,** Overall Chair of workshop (All)
09:15-10:00	Opening lecture - All participants • **Robert Jeraj** - *Medical physics got stuck in a box - how to get out*
10:00-10:30	Coffee
10:30-10:45	Introduction to the workshop - **Dirk Verellen and Wouter van Elmpt**
10:45-11:15	• *Machine Learning in clinical routine: A vendor's perspective* **Mats Holmström** (Senior Machine Learning Engineer, RaySearch, SE) (30min)
11:15-12:30	Pitches by participants
12:30-13:30	**Lunch**
13:30-14:00	• *Commissioning of a deep-learning based auto-segmentation method in clinical routine: How to open and understand the 'black box'?* **Charlotte Brouwer** *(Medical Physicist, UMC Groningen, NL) (30min)*

14:00-15:30	Pitches by participants
15:30-16:00	Coffee
16:00-17:00	Wrap up of the different topic workshops (12 min per topic) All

Day 2	**Saturday 26 October**
08:00-10:00	Workgroups: Do's and Don'ts, opportunities and pitfalls [4 work groups] - Training and development of AI models - Commissioning and quality assurance of AI models - Clinical implementation in daily practice - GDPR, Privacy and sharing of AI models
10:00-10:30	Coffee
10:30-12:30	Workgroups: Do's and Don'ts, opportunities and pitfalls [4 work groups] - Training and development of AI models - Commissioning and quality assurance of AI models - Clinical implementation in daily practice - GDPR, Privacy and sharing of AI models
12:30-13:30	**Lunch/commercial symposia**
13:30-14:30	Summary by workgroups; Discussion on next steps; take home messages; identify open issues for further research
14:30-15:30	Wrap up: highlights of the different workshops (12 min per topic) All
15:30-15:45	Closure
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15:30-16:00	Coffee
16:00-17:00	Wrap up of the different topic workshops (12 min per topic) All