Pre-Congress Symposium 7 (Oncology / Physics)
Saturday, October 13, 13:00-16:00

Session Title
Radiomics, AI and Machine Learning in Hybrid Imaging

Chairpersons
Patrick Veit-Haibach (Toronto)
Dimitris Visvikis (Brest)

Programme

13:00 - 13:25	Christian Blüthgen (Zurich): Radiomics, Radiogenomics, AI, Deep-Learning and Machine Learning - Definitions and Imaging Applications
13:25 – 13:50	Dimitris Visvikis (Brest): Basic Principles of Radiomics and Machine Learning - What Every Imaging Person should Have Understood by Now
13:50 - 14:15	Roland Hustinx (Liege): PET-Radiomics - How to Compete with Morphological Imaging
14:15 - 14:45	**Coffee Break**
14:45 - 15:10	Stephanie Tanadini-Lang (Zurich): Radiomics and Machine Learning in CT - Oncological Applications
15:10 - 15:35	Vicky Goh (London): Radiomics and Machine Learning in MRI - Oncological Applications
15:35 - 16:00	Igor Jurisica (Toronto): Future Applications for Radiomics, Machine Learning and AI in Hybrid Imaging

Educational Objectives
1. To learn the meaning of expressions such as machine learning, deep learning, radiomics. To understand some of the basic principles of machine learning in imaging. To get to know some possible applications of machine learning in imaging science.
2. Basics of radiomics and machine learning.
3. To understand the strengths and limitations of PET radiomics compared to CT & MRI radiomics.
4. To understand the opportunities and challenges of CT based radiomics analysis.
5. To understand the potential and challenges of radiomics and machine learning in MRI

6. Understand the possibilities and challenges of integrative computational biology. Recognize the potential of comprehensive data mining and machine learning. Appreciate current limitations and future possibilities of hybrid systems

Summary

1. Techniques of artificial intelligence will fundamentally change the workplaces of physicians in the next decade. The aim of this talk is to explain the meaning and differences of commonly applied expressions in artificial intelligence. After giving a short introduction to the basic principles needed for the understanding of machine learning techniques, the talk will focus on possible applications in imaging science.

2. Radiomics represents a rapidly advancing field in multimodality imaging today. Different aspects include the extraction of quantitative parameters from the reconstructed images and the subsequent predictive and prognostic modeling for oncology patient treatment management. The objective of this presentation concerns a description of the basic concepts in image features calculation and associated multiparametric modeling.

3. Texture analysis in CT has been evaluated for over two decades, while PET radiomics has really took off only recently. In addition, each imaging technique faces its own methodological challenges regarding the implementation of radiomics. The aim of this presentation is to compare the current results and status of PET radiomics with the data obtained with morphological imaging such as CT and MR.

4. Cancer patients get regular CT imaging for diagnoses, staging and follow-up. CT radiomics is a quantitative analysis of these images, which gives a comprehensive, observer-independent description of the shape and texture of the tumor. However many challenges remain such as imaging standardization, output standardization and big data modelling.

5. This talk will highlight the potential of MRI radiomics for oncologic patients, review the current MRI literature, to describe the challenges of radiomics approaches and how best to take this forward in the real world clinical practice.

6. Introduction to integrative computational biology. Overview of comprehensive network omics analysis and modeling. Towards hybrid systems in precision medicine.

Key Words

Radiomics, AI, Machine Learning, Deep Learning, Radiology, oncology, multimodality imaging, network biology, integrative-omics modeling, feature extraction, data mining, predictive models, Radiomics and machine learning in MRI – oncological applications