

# FIRST ANNOUNCEMENT

## Medical Imaging Artificial Intelligence – Radiomics, Deep Learning and Distributed Learning a hands-on course

9-12 December 2018 | Maastricht, The Netherlands

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**Medical imaging** has been the cornerstone for the management of patients for decades, particularly in oncology. Imaging data such as CT, MRI or PET are routinely acquired for every cancer patient in the process of diagnosis, treatment planning, image-guided interventions and response assessment. The use of image analysis in a quantitative way is now considered as one of the most promising techniques to **support clinical decisions**.

Genomics aims at identifying genes and gene mutation to characterize tumor or normal tissue. **Radiomics** looks at the phenotypic expression of genes, which results in particular imaging features or signatures able to characterize tumor and normal tissue. **Radiomics** is the high throughput extraction of large amounts of quantitative image features such as tumor image intensity, (multi-scale) texture, shape and size extracted from standard medical images (e.g., CT, MR, PET) using (semi)automatic software. These features are distilled through machine learning into 'signatures' that functions as quantitative imaging biomarkers. **Recently the radiomics approach has been enriched by Deep Learning methods**. A major challenge for the community is the availability of data in compliance with existing and future privacy laws. Distributed learning offers a solution to this issue and will be demonstrated. **Medical imaging combined with artificial intelligence will guide personalized cancer treatment in the future**.

### COURSE CONTENT

Our starting point is an overview of the history of Medical Imaging Artificial Intelligence we then discuss the success stories but also the pitfalls. Next, we will review the process from data acquisition, access to the DICOM objects, features extraction, machine learning (including new developments with Deep Learning) analysis and validation.

In the final part of the course, we will discuss the current challenges and directions of research in the field; in particular, the necessity of dealing with large annotated data sets, the FAIR principles and the distributed learning approach. The course will be divided into lectures during the morning and hands on assignments in the afternoon. Participants are encouraged to come with their data and we will organize (if possible) matching data for validation from other participants on the course.

### TARGET GROUP

The course is aimed at PhD students, PostDocs, Principal Investigators, Industry Professionals, etc.

### LEARNING OUTCOMES

At the end of the course the participants will have a fundamental knowledge and understanding of what Radiomics, Deep Learning, and Distributed Learning applied to medical imaging is. Participants will also have practical experience of applying this new knowledge and understanding.

### COURSE IN THE CONTEXT OF

The Marie Curie Network PREDICT, the STW project STRATEGY, the Interreg project EURADIOMICS

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#### Organising committee:

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#### Course secretariat:

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# PRELIMINARY PROGRAMME

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## SUNDAY – QIB AND RADIOMICS

- Morning**
- Welcome: Motivation, course overview, available tools by Philippe Lambin
  - Exam: baseline knowledge
  - The history of imaging
  - Quantitative imaging biomarkers
  - Radiomics: The basics
- Afternoon**
- Assignments: Radiomics Analysis
  - Presentation of the results and discussion

## MONDAY – DEEP LEARNING

- Morning**
- The history of Deep Learning
  - Deep Learning: The basics
  - Automatic segmentation
  - Deep Learning success stories
  - Company pitches
- Afternoon**
- Assignments: Deep Learning Analysis
  - Presentation of the results and discussion

## TUESDAY – DISTRIBUTED LEARNING

- Morning**
- Open source repository
  - The privacy laws in the US and in Europe
  - Anonymized, pseudonymized, and anonymized de facto
  - Distributed learning
  - The FAIR concept
- Afternoon**
- Assignments: Distributed Learning Analysis
  - Presentation of the results and discussion

## WEDNESDAY – HOLISTIC VIEW AND FUTURE PROSPECTS

- Morning**
- Potential clinical trial
  - Challenges and opportunities
  - Starting a community
  - Exam: response knowledge
  - Grand-Challenge/Moonshot
  - Kahoot! Competition
  - Farewell by Philippe Lambin