Programme de Formation

GATE Training on Medical Imaging (PET, SPECT, CT), Dosimetry and Radiation Therapy - Beginner Level - ENGLISH Course

Organisation

Durée : 21 heures

Mode d'organisation : À distance

Contenu pédagogique

Public visé

Students, researchers and engineers involved in medical physics. Physicians and medical physicists.

If you work on American territory, we invite you to contact by email the course director Mrs. Lydia Maigne - lydia.maigne(at)clermont.in2p3.fr - who will organize a special session for American trainees on adapted time slots when a group is formed.

Objectifs pédagogiques

- Learn the usage of the GATE platform for medical physics
- Understand the features of the platform dedicated to the development of detection systems (PET, SPECT, CT and X-rays) and detector response, the management of medical images, the development of clinical and preclinical beams in radiation therapy and dose calculation for different radiation therapy treatments (internal or external)
- Be able to use new tools for data analysis using Python

Description

All sessions will be divided in 2 parts. One part is dedicated to 15 minutes lecturer and is then followed by hands-on exercises with the GATE10 platform.

Introduction

- Information about the OpenGATE collaboration objectives, detailed information about the source code, examples and Python tools

Installation, configuration, and environment of GATE 10

- Description of GATE 10 environment and prerequisites for installation
- Description of the architecture and installation

Configuring your first simulation step-by-step
The following items will be developed through an example describing an electron beam interacting with a multi-slice phantom.

- How to build a geometry
- How to parameter the physics settings
- How to configure source of particles
- How to set up an actor
- How to analyse your data

Clinical dosimetry for internal radiotherapy treatment
The following items will be developed through an example describing a clinical dosimetry on a patient CT-scan for a 177-Lu internal radiation therapy treatment.

- How to import a patient CT-scan
- How to configure 177-Lu source based on SPECT images
- How to calculate dose to tumour and organs of interests

SPECT imaging
Simulation of a clinical SPECT camera.

- How to define the detector geometry: crystal and collimator
- How to define the phantom and the source
- How to fix the digitizer settings: energy resolution, thresholds, spatial blurring…

PET imaging
Simulation of a PET clinical camera.

- How to define the detector geometry: crystal and collimator
- How to define the phantom and the source
- How to fix the digitizer settings: energy resolution, coincidence sorter…

External radiation therapy treatment
Simulation of a linac accelerator for a Volumetric Modulated Arc Therapy.

- How to define a linac geometry: source, target, primary collimator, flattening filter, jaws, multi-leaf collimator and phantom
- How to calculate depth dose profiles and lateral profiles in a water phantom
- How to calculate a clinical treatment plan

Hadrontherapy
Simulation of a passive and a pencil beam scanning treatment using protons.

- How to configure a Treatment Plan source for the delivery of a scanned ion pencil beam treatment plan.
- How to calculate a treatment plan

Prérequis

Basics in particle physics and medical physics.

Modalités pédagogiques

- Training course in English
- Online training
- Lectures (5 h) and hands on (15 h)
- Practical course with 3 teachers for the group

Moyens et supports pédagogiques

Course materials and exercises corrected in PDF format as well as videos of the sessions will be given to participants.

EQUIPMENT**:** Participants will attend the training online through a dedicated web interface, they should attend the training with their laptop and connect to a dedicated GATE server through an ssh connection. Information for connection will be provided one week before the training. Sessions will be registered and provided remotely during 3 weeks after the training.

The training course is organized in partnership with the GATE collaboration.

Modalités d'évaluation et de suivi

Ongoing formative assessments throughout the course. A certificate of completion is issued at the end of the training.

Informations sur l'admission

Admission to this training programme is not subject to any examination, test or prior selection; registration is confirmed upon receipt of a complete application file and validation by the training provider.

Informations sur l'accessibilité

Our organisation is committed to ensuring inclusive and equitable access to its training programmes, whether delivered online or in person, for all participants, including people with disabilities. A dedicated accessibility contact is available to assess individual needs and, where possible, implement appropriate pedagogical, technical and organisational adjustments