**Computer Modeling in biology and medicine: *in silico* medicine**

**12-14 November 2019**

This three-day course will help you to understand the basics of computer modeling of biological systems, also referred to as ‘in silico medicine’. In accordance with the terms ‘in vitro’ and ‘in vivo’, in silico refers to silicium being the main component of computer chips. In silico medicine is the direct use of computer simulation in the understanding, diagnosis, treatment, or prevention of a disease. More specifically, in silico medicine is characterized by modeling, simulation, and visualization of biological and medical processes in computers with the goal of simulating real biological processes in a virtual environment. The emphasis of this course is on acquiring the necessary skills to understand what computer models can and cannot do, to understand their advantages and drawbacks and to be able to discuss computer models of biomedical systems with engineers and computer scientists.

**Aims of the course:**

* To introduce the participants to the basics of in silico medicine
* To define the main problems and research direction in the current field of in silico medicine as well as the steps taken to ensure its uptake in industry and clinics.
* To introduce the participants to the research that is performed on in silico medicine at GIGA

**Topics covered** include the basic vocabulary of computer modeling, the different types of modeling technologies and their applications. You will learn what input is required to create a computer model and how its results should be interpreted.

**By the end of this course the participants should be able to:**

* Be familiar with the basic vocabulary of in silico medicine
* Describe the main types of modeling technologies available
* Explain how to go about choosing the appropriate type of model for a specific research question
* Discuss the necessary inputs that go into the creation of the computer model
* Design proper experiments for computer model calibration & validation
* Understand in what ways computer models can intervene in biomedical research pipeline

**Who is this workshop for:** PhD candidates in the first half of their PhD trajectory, group is limited to 20 participants

**Location:** GIGA B34 +5

**Prerequisites:** basic knowledge of MATLAB programming (GIGA Doctoral School course “Introduction to Scientific Computing”); working knowledge of English; personal laptop (preferably with MATLAB pre-installed).

**Taught by:**

Liesbet Geris (course coordinator), Thomas Desaive, Mohamed Ali Bahri

GIGA- In silico Medicine and GIGA – CRC in vivo imaging

**Course program:**

**Day 1. 12th November. The basics & applications in regenerative medicine**

Educator: Liesbet Geris

**9:00 – 9:30** Course introduction. Goals, strategy and policies of the course

**9:30 - 11.45** In vitro, in vivo, in *what*? General modeling vocabulary

**11:45- 13:00** Lunch break

**13:00- 15:15** Applications in Regenerative Medicine

**15:30- 16:00** Q&A

**16:00 -17:00**  Personal assignment. Article selection.

**Day 2. 13th November. Taking it to the clinics & applications in cardiovascular diseases and intensive care**

Educator: Thomas Desaive

**9:00 – 9:30** Previous day summary presented by the participants

**9:30 - 11:45** In silico clinical trials

**11:45- 13:00** Lunch break

**13:00- 15:15** Applications in cardiovascular diseases & intensive care medicine (T. Desaive)

**15:30- 16:00** Q&A

**16:00 -17:00**  Self study

**Day 3. 14th November. Bringing images to life & creating your own model**

Educators: Mohamed Ali Bahri, Thomas Desaive, Liesbet Geris

**9:00 – 10:00** PET imaging (M. A. Bahri)

**10:00 -11:00** Kinetic modeling (M. A. Bahri)

**11:00- 12:00** Hands on session (M. A. Bahri)

**12:00–13:00** Lunch break

**13:00-15:00** Self study

**15:00–17:00** Presentations of course personal assignments (L. Geris, T. Desaive, M. A. Bahri)