#### PhD student: ALAOUI Nohayla

- Workpackage 1: "Mathematical and Computational Epidemiology".
- Supervisors: Pr. Moulay Lhassan Hbid, Pr. Mostafa Adimy, and Pr. Youssef Bourfia

## • Subject title and description: Thesis

Mathematical and Computational Modeling and Analysis of Cell Dynamics Models: application to the Evolution of some cancers

## • Overview of the subject

In recent decades, the role of stem cell dynamics in Cancer prevention and the development of cancer therapies is becoming more and more important. In particular, the role of certain cells called "cancer stem cells" has attracted much attention because of their ability to evade the immune system. To this aim, we are interested in studying the dynamics of normal and cancer stem cells by proposing and analyzing new mathematical and computer models.

# • Subject objectives

- Bibliographic study.

- Review of existing models, implementation of new models, and computer simulations.
- Writing articles describing results obtained.

- Setting up computational models.

### • **Progress report**

The first phase of my thesis is devoted to bibliographical research study. To this aim, I've started by writing a synthesis in which I present some mathematical models that exist in the literature, describing the dynamics of the stem cell population involved in the blood production process in the bone marrow, such that the process called hematopoiesis. In this synthesis, I provide an overview of how these mathematical models have played an important role in understanding the origin of the uncontrolled proliferation of blood cells in some hematological disorders.

In the other hand, we are starting to develop a mathematical model describing the dynamics of a hematopoietic stem cell population. Our purpose is to focus on the stability analysis of a nonlinear system of state-dependent delay equations. Furthermore, we manage to use a numerical simulation to identify the role of each parameter and the influence of the state-dependent delay in the stability switch of the positive steady state.