Project for Master´s thesis

Comparative analysis of gene expression underlying heart development:

From *in vitro* to *in vivo*

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Websites:

http://www.sysbiolab.eu

http://www.cbme.ualg.pt/jbraganca_cbme.html

Heart development is a highly complex process with a series of precisely spatially and temporally ordered events on molecular level. It has recently attracted great interest due to potential applications of regenerative medicine to heart failure, which has become one of the major causes of morbidity, especially in developed countries with an aging population. To gain a better understanding of heart development, it is necessary to study the underlying gene expression and its regulation.

In this master thesis, the student will analyze and compare gene expression from murine stem cells differentiating *in vitro* into heart muscle cells (cardiomyocytes) with gene expression profiles of samples taken from the mouse heart during development. The data have already been obtained using microarray technology in the framework of an international collaboration.

The goals in the master thesis is (i) to identify similarities and differences between expression profiles obtained *in vitro* and *in vivo* and (ii) to detect the regulatory pathways and processes driving heart development through exploiting the complementary data. This type of analysis can also help to identify novel genes with a role in heart development and provide new valuable targets to experimental laboratorial analysis.

To carry out the research, the student will use various bioinformatics tools. Thus, he/she should be interested in conducting bioinformatic analysis. Existing knowledge in statistics, programming and bioinformatics is clearly of advantage, but not required, as necessary computational skills will be taught at the beginning of the thesis project. Although the thesis is computationally orientated, experimental work can be included if the student is interested.

The work is part of the FCT-funded project *Alternative splicing and its impact on molecular interaction networks during stem cell differentiation (FCT - PTDC/BIA-GEN/116519/2013)* and of international collaboration with the research group led by Prof. Agapios Sachinidis (http://www.uni-koeln.de/med-fak/physiologie/np/sachinidis.htm) at University of Cologne, Germany.