Virtual Autumn School
"Informatics and Translational Issues in the Field of Genomic Signal Processing"
15-19 September 2014
New Bulgarian University, Sofia, Bulgaria

The Autumn School was held through videoconference connection in one week period from 15 – 19 September 2014 from Texas, USA, where assoc.prof. Ivan Ivanov, PhD - a specialist in mathematical modeling in gene networks - presented methods of analysis in the form of computer programs, currently available software's for analysis of microarray data and the limitations in their application, as well as current issues and versions of their mathematical modeling and decision. School ended successfully with Workshop, where the students presented multimedia presentations, which were again demonstrated through a virtual connection with the lecturer. They also received Certificate, signed by assoc.prof. Ivan Ivanov, PhD.

Introduction

Translational science transforms a mathematical or computational model, whose purpose is to provide a predictive conceptualization of some portion of the physical world, into a model characterizing human intervention (action) in the physical world. Scientific knowledge is translated into practical knowledge by expanding a scientific system to include inputs that can be adjusted to affect the behavior of the system and outputs that can be used to monitor the effect of the external inputs and feedback information on how to adjust the inputs.

According to **Arturo Rosenblueth and Norbert Wiener**: "The intention and the result of a scientific inquiry is to obtain an understanding and a control of some part of the universe."

A translational scientific model is itself a scientific model. It is the purpose to which a model is put that makes it translational. The conceptualization of a transformation of a physical process takes the form of a mathematical operator on some mathematical system, which itself is a scientific model for the state of nature absent the transformation. Two problems need to be addressed: *analysis* and *synthesis*. In the advent of new high throughput *omics* technologies, the related Informatics issues and the modeling of the signals detected by such technologies become critical components of any translational model with implications to human health. Broadly defined Informatics encompasses computing technologies and development in their diverse relations to the human and social worlds, including applications in science, and social problems. The modeling of the signals detected by the modern omics technologies is the subject of a relatively young field – Genomic Signal Processing (GSP). GSP focuses on understanding of both the structural and functional properties of genomic regulation and is based on System Approach + Signal Processing.

This workshop touched on many of the important translational issues involving the interactions between the Informatics and GSP in applications where omics data can be used to provide solutions to human health problems. The workshop topics included:

1. Basics of molecular biology
2. The -omics technologies and human health
3. Next Generation Sequencing (NGS) - an overview of data processing pipelines.
4. Databases containing omics data and standards in data collection. Reproducibility of results in research studies.
5. Translational issues in Genomic Signal Processing