UNIVERSITAT POLITÈCNICA DE VALÈNCIA

GIEM Grupo de Ingeniería Estadística Multivariante

PhD Student Position funded from the Spanish Scientific program FPI-MICINN 2012

Within the frame of the ´SUBPROGRAMA DE PROYECTOS DE INVESTIGACIÓN FUNDAMENTAL NO ORIENTADA. CONVOCATORIA 2011, of the Spanish Ministry of Economy and Competitiveness, a **4 year Ph.D. student position** assigned to the multidisciplinary project "Multi-scale inference, monitoring, optimization and control: from engineered cells to bioreactors (MultiScaleS) (DPI2011-28112-C04-02)" is offered.

PROJECT SUMMARY:

Within the *systems and synthetic bioprocesses* context, MultiScaleS is devoted to provide systematic methods, tools and protocols for inference, real-time monitoring, optimization and feedback control of bio-systems by means of multi-scale strategies, spanning from micro (e.g. metabolic and genetic networks) to macro scales (e.g. population macroscopic dynamics as used in the context of bioreactors monitoring and control). MultiScaleS expected results will be instrumental to achieve end products inside specifications and optimal productivity while operating at intensified regimes. It is expected these results can also be applied within other industrial contexts characterized by muti-scale dynamics and coordination of dynamical agents.

MultiScaleS will focused on:

- Further investigating, improving and exploiting topics concerning multi-scale model building and analysis methods and tools, including systematic model building and experimental design, grey modelling, scaling-up, inference in biological systems, and multicellular coordinated dynamics analysis.
- Novel multi-scale optimization and control methods, including new metaheuristics for optimization and optimal control in metabolic engineering, optimal integrated design and control (steps towards synthetic biology), model-based software sensors (observers) accounting for multiple scales, bioreactor control considering the metabolic state and constraints, and control of cell interactions.
- Application to biotechnological industrial production, with special emphasis on how low-level biological metabolic states can be controlled at the bioreactor level. Proof-of-concept on real industrial cases.

PhD THESIS PROJECT

This PhD project deals with research into advanced multivariate methods for the analysis and monitoring of biochemical processes, with special focus on real-time technologies, dynamics, diagnostics and interpretation. Specific fields of interest include:

- Multi-scale grey modelling of bioprocesses.
- Exploratory biochemical data analysis.
- Real-time data pre-processing
- Real-time models, including appropriate statistical monitoring limits

- Monitoring approaches for situations when limited training set data is available
- Translation of out-of-control signals to operator actions
- Transfer of monitoring models between manufacturing units
- A rational approach for selecting the level of information required for process monitoring at the required level of confidence.

The candidate is expected to interact in a multidisciplinary team, comprising the GIEM group (multivariate statistical engineering) and GCSC (research group in Complex Systems Control) at the Universidad Politécnica de Valencia. The candidate will be anchored at the GIEM group (Valencia, Spain) with Alberto Ferrer as supervisor. During the PhD it is contemplated the candidate to do research stays with other research groups abroad.

The candidate is expected to use advanced multivariate statistical methods to develop methods and algorithms for the project. The ideal candidate should have a degree in engineering, statistics, chemistry, computer science, mathematics, physics or equivalent discipline with good academic grades, and have some proficiency in programming languages (e.g. Matlab).

CHARACTERISTICS OF THE GRANT

Subsidized costs

- Salary
- For those students that are granted by the FPI program, there is also the option to obtain funding for temporary stays in another organization in Spain or abroad.
- Duration of the grant: 4 years maximum (2 years grant + 2 years training contract).

Funding

Maximum period is 48 months, divided in 2 subperiods:

1st sub-period (maximum of 24 months): Grant. The applicant must obtain the Master degree of the corresponding postgrade program. It is subsidized with 1.142 € gross per month.

2nd sub- period (maximum of 24 months): Training Contract subsidized with 16.422 € gross annually.

APPLICATION PROCESS

Please send the letter in English language, including a personal motivation, your academic grades and curriculum vitae, to Alberto Ferrer (aferrer@eio.upv.es).

Applications must be submitted through the telematics application which is opened at the Spanish Ministry of Economy and Competitiveness website **from February 8th**

until February 23th at 3 pm (https://sede.micinn.gob.es/becasfpi/).

Once all the information has been fulfilled and submitted electronically, a printable application document will be generated by the website. This document should be signed up and presented at one of the Spanish Postal Offices (oficinas de Correos de España) or Spanish embassies or consulates abroad. The address to send the documents is the following:

SUBDIRECCION GENERAL DE FORMACION E INCORPORACION DE INVESTIGADORES. MINISTERIO DE ECONOMÍA Y COMPETITIVIDAD, C/Ramírez de Arellano, 29 (28043 MADRID).

For more information, applicants are referred to BOE.

http://www.micinn.es/portal/site/MICINN/menuitem.dbc68b34d11ccbd5d52ffeb801432ea0/?vgnextoid=e962ae533a2c4310VgnVCM1000001d04140aRCRD&vgnextchannel=8da5b9746e160210VgnVCM1000001034e20aRCRD