Program INPhINIT Fundacio La Caixa

Project title / Job position title: Personalizing health care in Multiple Sclerosis using systems medicine tools

Area of knowledge: Life Science Panel

Group of disciplines: 3) Biotechnology, Bioinformatics, Pharmaceuticals, Food technology

Research project / research group description (up to 2000 characters including spaces).
We aim to develop new tools based on systems medicine to improve and personalize the management of patients with a complex disease, such as Multiple Sclerosis (MS). This requires developing computational models into which clinical information and omics data from diverse sources can be integrated and which can be used to generate algorithms that can predict the disease course and future disability in specific subgroups of MS patients, as well as aid the selection of the best therapy for each individual. The validity, utility and cost-effectiveness of 'omics' based health promotion and disease prevention programmes, will be addressed by Sys4MS, allowing informed decisions on the organisation of health and care systems.

Our hypothesis is that by integrating selected molecular and cellular information into mathematical models of MS pathogenesis, we should be able to simulate the dynamics of disease pathogenesis at the individual level, taking into consideration genetic susceptibility and environmental exposition. By using quantitative endophenotypes, such as brain atrophy (provided by MRI and OCT), we will be able to associate the dynamics of biological damage to the evolution of clinical activity and disability. Our hypothesis is based on previous work in which a close relationship between computational models of T cell dynamics and the clinical course of the animal model of MS and the clinical course of the disease in patients was established. Thus, we postulate that the models we will derive should provide predictive information that can be applied to specific subgroups of patients at the clinical level.

The specific goals of the project are:
1. To integrate clinical, omics and imaging information into computational models of MS and to develop algorithms that predict disease activity, future disability and response to therapy
2. To validate the clinical algorithms and evaluate their benefits in short clinical studies, as well as in prospective database studies

Job position description (up to 2000 characters including spaces).
We are seeking for a highly motivated PhD student with background in physics, mathematics or computational sciences (Artificial Intelligence) interested in applying her/his expertise to the improvement of people health. Having proven excellence in mathematics or physics is a requirement. The student is going to work under the supervision of a clinical scientist with expertise in systems medicine (Pablo Villoslada) and a physicist expert in systems biology and dynamical systems (Jordi Garcia-Ojalvo). Both researchers have been working together in the last 10 years in the application of

systems biology to the modeling of Multiple Sclerosis, including mentoring several PhD students and postdocs. Therefore, the applicant should work in a multidisciplinary team composed by physicians, physicists, computational scientists and bioinformaticians, requiring good team-work skills. Leadership abilities will be highly valuated in order to drive the project to the optimal solutions and interacting with several teams from the different European projects we are participating. We provide significant freedom to develop the research projects and impulse creativity, which also implies significant responsibility for accomplishing the tasks and objectives of the project. Short-term research stays would in the collaborating research groups of the Sys4MS, CombiMS, MultipleMS projects are expected, as well as in other top research centers in Europe or USA in the field of systems biology and precision medicine. The team has also great expertise in translational research and innovation, having obtained several patents and created several start-ups, which would benefit the trainee.

IDIBAPS Group Leader: Pablo Villoslada Diaz

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Research project / research group website (link to the group website).
http://www.neuroimmunologybcn.org

Related links to the position (up to 5 links to public CV such as ORCHID, project, etc.).

Co-director for physicists/mathematicians/computational scientists students
Prof. Jordi Garcia-Ojalvo (physicist).
Dynamic Systems Biology Lab. University Pompeu Fabra
http://dsb.upf.edu

European projects supporting this research program
1. CombiMS project of the European Commission (Horizon 2020)
http://www.combims.eu

2. Sys4MS project of the European Commission (Horizon 2020): ERACOSYSMED
http://www.neuroimmunologybcn.org/research/pathogenesis-and-novel-therapies-multiple-sclerosis/sys4ms/

3. MultipleMS project of the European Commission (Horizon 2020)
Website under construction. You can visit this link to learn about the program
http://ki.se/en/imm/gems-genes-and-environment-in-multiple-sclerosis