

1. Interested institution:

University of Navarra – Institute for Culture and Society

2. Brief Description of the Group

Prof. López-Fidalgo has been recently hired by the Institute for Culture and Society of the University of Navarra. He has been leading a research group in Spain on Optimal Experimental Design (OED) with more than 20 researchers from several universities in Spain (Salamanca, Castilla-La Mancha, La Laguna, Pública de Navarra and Almería) as well as some significant collaborators from abroad (UCLA, Indian Statistical Institute, University of Milan, Linz, Glasgow or Manchester). This group is one of the eight nodes of the Spanish Network of Biostatistics (BioStatNet). It was also acknowledge as a research group by the Spanish Statistical Society (SEIO) and it has been supported by different grants from the Spanish Research Agency since 2004, apart from some regional and local grants or other from companies. They had a couple of joint grants with Britain (Universities of Manchester and Glasgow) and Austria (Economics University of Vienna). In 2010 the ESF awarded a Research Networking Programme between 15 European countries with this group in Spain, but some governments did not support the grant and it was not carried out at the end. The group has a position in the Optimal Experimental Design international community. In particular, the group organized the prestigious conference mODa 8 in Spain, where the most prominent researchers in the topic were invited to participate.

Prof. López-Fidalgo has also started a new group with 14 people in the University of Navarra, including researchers from the Public University of Navarra and the company Everis. The main goal is to establish a group of people working on optimal experimental design collaborating at the same time in other areas of the Institute as well as in other centers of the University. This fellowship will strongly contribute to establish and consolidate the team.

3. Please tick the areas of research (as established in Marie Skłodowska Curie Actions)

- | | |
|--|---|
| <input type="checkbox"/> Chemistry (CHE) | <input type="checkbox"/> Environmental Sciences and Geology (ENV) |
| <input checked="" type="checkbox"/> Social Sciences and Humanities (SOC) | <input checked="" type="checkbox"/> Life Sciences (LIF) |
| <input type="checkbox"/> Economic Sciences (ECO) | <input checked="" type="checkbox"/> Mathematics (MAT) |
| <input type="checkbox"/> Information Science and Engineering (ENG) | <input type="checkbox"/> Physics (PHY) |

4. Research / Project Description

The design and analysis of experiments has been used to improve estimates and predictions in empirical processes. It is remarkable the utility of measuring the efficiency of the implemented designs in the practice as well as providing more competitive designs for the optimal use of the available resources. In this context, the Optimal Experimental Design (OED) is a discipline that

addresses this problem from different points of view. One of the main beneficiaries of the theory of optimal design are the areas of health and well-being in society. There will be also contributions to other areas. In the last few years, the members of the group have applied the ideas of their methodological developments in OED to different multidisciplinary areas. In many cases, the team has worked with real problems, for example modeling the risk in lung surgery, the retention of radiation in the human body, problems involving safety in possible mine jams, the calibration of the dose of radiation to be applied to a patient or the optimal fermentation of wine, among other examples. In all of these cases, there has been personal contact with the researcher or the people working with these problems. The experience shows this actual contact with real problems leads to the most interesting statistical methodological problems. Proof of this is the publication of these results in prestigious journals in Statistics such as JASA, JRSSB or Technometrics.

This project seeks to develop methodologies in the area of the optimal designs of experiments in order to provide solutions to real problems. The proximity to the real cases leads to more complex processes. Specifically, the general objectives in this project are the following:

- I. Identification of new models and computation of optimal designs for pharmaceutical application and mixture of distributions in ligand binding modeling with more than one proteine.
- II. Selection of models. New methodologies for a priori selection of models will be considered. In particular, the problems of goodness-of-fit tests, discrimination between models, estimation of the uncertainty in the parameters in compartmental models and modelling through structural equations will be layed out.
- III. Identification and quantification of the levels of the exposure to radiation, adversed effects and detection of inmunological deficiencies in toxicology, dose-response and calibration.
- IV. The so called nature-inspired methods will be explored to compute optimal designs in difficult situations such as many variables or the presence of non-controllable variables.
- V. Optimal designs for models with censoring; in particular, in suvival analysis, will be explored.
- VI. Implementation of free and friendly software for the mentioned objectives.

5. Who can apply?

General requirements:

At the deadline for the submission of proposals (14/09/2017), researchers:

- shall be in possession of a doctoral degree or have at least four years of full-time equivalent research experience.
- must not have resided or carried out their main activities in the country of Spain for more than 12 months in the 3 years immediately prior to the abovementioned deadline.

Specific requirements:

A PhD in Statistics, Mathematics or other area with strong load of Statistics methodology.
Interest in Experimental Design research, both in a methodological and an applied perspective.
Reasonable English speaking and writing skills.