Essay Start Letter

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August 30, 2014

I am an applied mathematician. Therefore, my research interest are often connected with the iteration which other fields. On the other hand, mathematics is ,"I think", the more interdisciplinary subject, since it has applications in so many other fields that is almost impossible to take it apart.

Hence, this letter is for informing that I'm very interested in to participate on the Intercontinental Academia project. Given the congregation of different field in the Intercontinental Academia project, I consider this opportunity a big step and a seed in international collaboration projects between different fields of research.

Below is a brief description of projects that where my research subjects can be applied directly and TIME is a key ingredient in research projects. They are just an essay and of course that Im interested in participate on other projects that will be running in the Intercontinental Academia project.

1 Research experiences and related projects

My experience in research is in Applied Mathematics, with particular emphasis in Inverse Problems and Applications. An inverse problem is a general framework that is used to convert observed measurements (where TIME is one of the key instruments) into information about a physical object or system [6, 2]. Such a field of research arises in many branches of science and mathematics, including statistics, statistical inference, geophysics, medical imaging (tomography), ocean acoustic tomography, nondestructive testing, astronomy, physics, computer vision, natural language processing, biology, finances and many other. For some references, see [1, 8, 7, 9, 4, 6, 2, 5]. Solutions of inverse problems in those fields involve interaction between mathematical theory (functional analysis, optimization methods), computational issues (scientific computing) and practice (iteration with professionals of many areas - industry and academia).

Below, in a fill lines, we will describe some possible sub-projects suitable for been developed within the International Academia project.

1.1 TIME in mathematical modeling and applications

Nowadays, mathematical models are extensive used in natural sciences (such as physics, biology, earth science, meteorology), engineering, social sciences (such as economics, psychology, sociology and political science), economists, etc with the intention to explain the effects of different components or to make predictions about the behavior of a system. Obviously, in this context, TIME can seem as the ingredient in the system evolution for which we want to know the results.

The applicability on a specific scientific field depends on how well the mathematical models developed on the theoretical side agree with the results of repeatable experiments. Lack of agreement between theoretical mathematical models and experimental measurements often leads to important advances as better theories are developed. In particular, mathematical system modeling has many coefficients that plays the rule of adjustment between the theory and the observability. Calibration of such set of coefficients is crucial for the precision of the prediction system. Such a problem (calibration of coefficients from the indirect observability o the outcomes) is an inverse problem [9, 4, 6, 2, 5].

1.2 TIME in biological system

It is now clear that an understanding of how cells and organisms carry out their functions cannot be gained by looking at cellular components in isolation. Instead, consideration of the interplay between the parts of systems is indispensable for analyzing, modeling, and predicting systems' behavior. Biological systems manifest many important examples of

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emergent properties (a result of the interplay of the cause-and-effect) in the complex interplay of components during TIME.

Studying biological processes under this premise, systems biology combines experimental techniques and computational methods in order to construct predictive models, where again, inverse problems arises naturally. See [3] and references therein.

In the system biology subject I have three students working on inverse problems projects in bioconversion of substrates, protein interaction network and circadian rhythm.

1.3 TIME in finance and economics

Roughly speaking, finance is the TIME value of money, which states that purchasing power of one unit of currency can vary over TIME and aims to price assets based on their risk level and their expected rate of return. Yet, financial economics is the branch of economics studying the interrelation of financial variables, such as prices, interest rates, volatility and shares. It centers on managing risk in the context of the financial markets, and the resultant economic and financial models. A good parameter model calibration in crucial for understood finance models. See [1] and references therein.

Although many works in this field have been developed until now, given the stochastically developed models and key TIME rule in such models, recently a new branch of intense research is related to fractional derivatives applied to finance and economics.

Actually, I have two students working on projects related to parameter calibration in quantitative finances and other research projects in the field with the participation of some of my collaborators.

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