

Andrea De Gaetano, Istituto per la Ricerca e l'Innovazione Biomedica del CNR (CNR-IRIB)

Titolo: *Modeling glucose metabolism with FSDEs*

Abstract: Fractional differential equations may be used to summarize, with an order that can in principle be estimated from data, different (presumably integer-order) interacting controls or influences upon the observed variable of interest, especially if the information content of the observations is relatively small compared to the complexity of the system of interacting variables. This is the case, for example, of trans-cutaneously measured glycemia, where besides glycemia itself (possibly decaying by first-order elimination) also unobserved factors (insulinemia, other hormones) may exert higher order effects. The problem is complicated by the fact that random events (food intake, exercise, emotions) may affect glycemia as well, leading to the formalization of the problem as a Fractional Stochastic Differential Equation (FSDE). We exemplify the use of simple FSDE models of glyceamic control and undertake model parameter estimation in this framework. The difficulties in dealing with a numerically daunting task, while attempting to adhere to a physiological interpretation of the available data, are described.