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Instantaneous, intelligent and robust time series data modelling and network inference

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Dynamic processes in complex systems may be profiled by measuring system properties over time. One way of capturing and representing such complex processes or phenomena is through ODE models of measured time series data. However, construction of ODE models purely from time series data is extremely difficult. First, the system targeted must be identified. Second, the parameters of the model must be estimated in a data consistent manner. Lastly, the constructed model must be capable of exact simulation of the measured historical data as though the constructed model was the means (source) of the acquired data. Hence, intelligent modelling of exact data may be a necessity in modelling systems that are not well-studied or well-known. The requirement to achieve the above-mentioned objectives within a short period of time, i.e., in order to cope with occasional or necessary demands of rapid data utilisation, makes both model construction and complex systems identification a modeller's nightmare. In this presentation, a novel dynamic modelling technique (framework), invented and currently being further developed by the author, is proposed and presented as an effective computational method for reconstructing data-consistent ODE models, which adequately addresses the challenges of instantaneous systems identification and automated parameter estimation, under limited data and under-determined conditions. These dynamic modelling techniques (algorithms) enable data-consistent models of complex systems to be automatically constructed, with or without making *a priori* assumptions about the underlying network, which guarantees successful construction of feasible models in a matter of seconds. These claims are then justified with applications and examples.

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Lognormal distribution and its applications in biological and medical sciences

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The lognormal distribution is one of the important continuous distributions in statistics and due to the fact that it is positively skewed and effect of variety of forces working independently on the variability of lognormal distribution is multiplicative, it has many applications in Biological and Medical Sciences. Many of its descriptive characteristics and its relationships with other distributions have been explored and found to be very useful and interesting. As we know the lognormal distribution is positively skewed and positively skewed distributions are particularly common when mean values are low and variances are large and values cannot be negative, many measurements in Biological and Medical sciences show more or less skewed distribution and due to this fact the lognormal distribution is playing a major role in Biological and Medical sciences as compared to normal distribution. For example, the distribution of incubation period of infectious diseases; distributions of chemicals and organisms in the environment; distributions of sensitivity to fungicides in populations and distribution of population size; the distribution of times to the appearance of lung cancer in cigarette smokers, etc., have been shown to be log-normally distributed. In this paper, an attempt has been made to discuss detailed applications of lognormal distributions in different areas of Biological and Medical Sciences based on the data collected from Eritrea and other countries and it has been observed that lognormal distributions is a better fit.

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