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Preface

The challenge of modelling aggregated human behaviour

Mathematical modelling is a blooming area of applied mathematics, and it is not yet sixty years old. At its beginning, engineers were the main practitioners of this new area of mathematics, developing mathematical models for solving engineering problems in natural sciences. More recently, financial engineering is dealing with mathematical models based on market behaviour, where implicitly human behaviour is involved in an aggregated way, through the dynamic change of the underlying asset price.

In the recent past of the conference (Mathematical Modelling in Engineering & Human Behaviour), mathematical modelling of social behaviour, such as addictions, social disorders, or educational achievement, has emerged.

A paramount issue in the study of social behaviour is social contagion, not only by the influence of the Internet and social networking, but also by mimetic human behaviour [1,2]. This mimetic human behaviour justifies in part why aggregated human behaviour is modelled, not individual behaviour.

Thus the followers' behaviours are modelled; however, the behaviours of successful leaders, who are a nearly negligible minority, are not modelled. In contrast, individual human behaviour is not modelled, because it is unpredictable and even irrational. A human being is under emotional pressure (for instance, fear, panic, or greed in financial matters), or even, considering emotional stability, an individual usually values scarcity over the utility of the products themselves (for instance high-quality and cheap locally produced agrarian products). A human being undervalues what is easy to obtain.

One of the main differences of the modelling process of human behaviour is that, after data collection, experts use writers', philosophers' and sociologists' thoughts to launch hypotheses that need to be accepted instead of well-established scientific principles. This is in sharp contrast with modelling in other areas, such as Engineering and Medicine, where well-established laws and scientific principles determine the mathematical model we have to define and solve. This fact links mathematical modelling with unforeseen areas, such as literature, philosophy, sociology, psychology, and other social sciences.

The special condition of modelling the human behaviour can also cause collateral damage to those susceptible people with an ideologically opposite point of view, since the results are not ideologically neutral. Consequently, moral issues arise. Should we publish results that can be useful for the majority of the population even when they bother a minority? Our opinion is affirmative, of course, if the hypotheses of the models are shown with clarity and transparency.

Prudence is always advisable, but its excess just because it could cause some trouble to highly sensitive people should not stop the study of human behaviour, since it is useful for society, in general. The crucial issue is related to the modellers and practitioners' ethics, which should focus on the information reported to the users (public authorities, educators, parents, CEOs, and so on) about the hypotheses assumed in the model; that is the essential moral issue.

Models as approximations to the real world cannot be wrong. The unrealistic hypotheses are what make models inapplicable. If a financial mathematical model, for instance, assumes that investors are rational individuals, the information is transparent and/or equally and instantly accessible; the investors are risk averse and prefer to hold diversified portfolios; the investors have access to unlimited low-cost leverage; the trading does not affect the market price; there are no transaction costs in trading securities; in any of these cases, the model would not be guilty of any financial damage; see [3].

The guilty ones are those who do not know the hypotheses, or apply the model without a profound knowledge of it, or even worse, those who have an unethical behaviour; this would be the case of a broker who recommends his/her clients to invest in some securities without telling them about the risk of bias towards idealistic hypotheses of the underlying model.

We conclude by thanking all the participants, co-organizers, referees, sponsors, and especially our University, for its financial support and providing us with the facilities with which to host the event. All of them have contributed once again to the success of the conference.

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