Predictably Unpredictable

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Among all quips of the famous American writer, Mark Twain (Samuel Langhorne Clemens), my two favourites are "*Lies, damned lies, and statistics"* and" "*It is best to read the weather forecasts before we pray for rain".* I find these two particularly fascinating because they remind me of the paradox and the slippery slope of predicting the future. I think we all agree that pandemic has humiliatingly shown us that the future is unpredictable. None of our complex and intelligent models that have been built over years of data could predict the recent pandemic. However, we still use them to understand the spread of the virus, to predict the results of interventions, and to make science-led policies. Isn't it ironic? This editorial looks at the paradox of prediction, the certainty of having uncertainly, and the predictability of having an unpredictable future.

Many years ago, when we did not have any knowledge of Meteorology, atmospheric laws, and statistical forecasting, our ancestors might have prayed for good weather. Later on, we developed our understanding of how climate and atmosphere work and gathered data to produce statistical and numerical weather prediction models. This has allowed us to be able to forecast near future weather with a relatively acceptable level of uncertainty. Obviously, this does not mean we can predict weather condition for Easter Monday 2078 but for tomorrow early afternoon, one may rely on Met office models. We have certainly, moved on from the time of total randomness when we had no knowledge of our surroundings, but we cannot predict accurately if we go too far.

This pattern, i.e. getting to know phenomena and build a model that can help to understand what is going on but useless when it is used for too far in time or space, exists in many complex and inter-related phenomena. That is because there are so many parameters, too many unknowns, and too many interrelated factors and interactions that we either cannot model, or simply do not know exist. In this sense, launching a rocket is not complex, but the human body is complex. Launching a rocket is certainly complicated but it is possible to use some models that can take inputs and give you the rocket location and status accurately. On the other hand, the human body and stock market are complex. There is not a golden algorithm and model that tells you how our body reacts to a certain medication, or how the market behaves in a few month time. What we do know is almost whenever human is involved, there are some levels of complexity are added. Humans are complex bread! But one wonder, if humans are not easy to model, then the usability of technologies that are used by a human is subject to complexity and unpredictability.

Yes! It is difficult to factor in human creativity or forecast how a piece of technology can be used, misused, vandalised, and repurposed. This means there is a limit to what we can say or expect about the future. However, it certainly does not mean we should stop modelling complex phenomena just because there is a limit. The whole science is about pushing boundaries of that limit and develop our understanding and knowledge. Like weather forecast example, our models have gone much better both in terms of

accuracy but also the extent of use. Our knowledge of human mobility, biology, human-computer interaction has extensively improved. And there are better models to help us factor in the interactions between phenomena. Complexity theory is one that is used to construct a holistic model of, for example, human behaviour. Also, we have a better understanding of the parameters and phenomena that play role in a complex system. Famously Donald Rumsfeld said *"There are known knowns. These are things we know that we know. There are known unknowns. That is to say, there are things that we know we don't know. But there are also unknown unknowns. There are things we don't know we don't know."*

Research helps us to find those hidden unknown unknowns and get to know them or at least make them known unknown! For example in this issue of the journal, Trapsilawati et al (2021) look into the underlying predictors of speeding behaviour and examine the effects of demographic variables on the perceived deterrent mechanisms and predict speeding behaviour to target appropriate prevention programmes. Their paper, which focuses on human behaviour in speeding and driving, looked at 212 randomly selected drivers with valid car driving licences and concluded that the demographic variables play an important role in drivers' perceptions towards social and legal sanctions as well as material loss. These findings can be used for policymaking and designing the prevention programmes that prioritise young and single drivers.

Shubina et al., (2021) looked at the adoption and efficiency of the digital contact-tracing apps that are used by many countries to control or monitor the covid-19 pandemic. The adoption of digital contact tracing apps is certainly a good example of a complex challenge. Their paper considered a wide range of factors within three categories of technical, epidemiological and social ones, and incorporates these into a compact mathematical model. The paper evaluates the effectiveness of digital contact-tracing apps based on received signal strength measurements. The results highlight the limitations, potential and challenges of the adoption of digital contact-tracing apps.

Scagnetto et al., (2021) looked into the context-awareness and the end-users of the system. Mahmoudi et al., (2021) studied the challenges of the general airborne camera by modelling the uncertainty and imperfection of the different components. Lens distortion, image delay, rolling shutter, motion blur, interlacing, vignetting, image noise, and light level are modelled.

Bao et al (2021) identify the root causes of young seafarer attrition through semi-structured interviews and questionnaires. The findings of the study show that occupational recognition and family responsibility are the two major factors contributing to young seafarers' outflow. Chinese seafarers' health status is another important factor that has received little attention. In addition, age seems to play a major role in this. This paper suggests that a clear career plan could be a potential solution to retain this backbone group as prospective senior officers.

There is a growing push for having more human-in-the-loop systems to make sure the data-driven technologies are not blindly over-rule human behaviour and needs. With the rise of new technologies like autonomous cars, and unmanned aerial vehicles (UAVs) moving around complex and unpredictable cities and humans, there is even more need for having a better understanding of parameters and interactions between players of such complex system. But one thing is always true; there is a limit to what extent we can predict.having a better understanding of parameters and interactions between players of such complex system. But on thing is always true; there is a limit to what extent we can predict.

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