

# Modelling and the rise of Machine Learning

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**Abstract:** As we move towards an increasingly digitalized world, the use of models has become more ubiquitous than ever. From predicting the weather, optimizing supply chains, managing natural resources and predicting stock prices, models are being used to analyse and predict increasingly complex systems to help solve pressing real world problems. However, with the rise of the technology sector and the associated AI and machine learning, traditional modelling methods and approaches are being challenged.

This challenge raises fundamental questions for all disciplines that use modelling and simulation to understand and predict systems, but discussion of this can be complex. Mark Zuckerberg's much celebrated advice to "move fast and break things" sits uneasily with the traditional scientific culture which seeks to accumulate knowledge and is often conservative about new ideas. But if moving fast means there is no time to understand what has come before there is little ground to have an informed debate. And while breaking things is a crude approach to analysis, it could be at least tolerated if the things broken had outlived their usefulness. But as an approach to debate it has significant limitations. While Zuckerberg's quote is only illustrative there are related systemic issues. The alignment between commercial interests in the tech industry and AI/ML means that on some occasions marketing and hype can have the same standing as truth and delivery. And the discipline of computer science continues to form after a difficult childhood, transitioning from an often vocational focus to being at the forefront of major innovation.

In this talk, we will explore the future of modelling and the rise of AI and machine learners. For all the complexity and noise in the debate, developments in computational science and technology are one of the most exciting and active innovation frontiers in science and the economy at this time, and show no signs of diminishing. We will discuss where machine learning methods are challenging and complementing traditional modelling. We will also discuss topical debates in the technology sector around Responsible AI and Synthetic data. The Responsible AI movement seeks to develop standards, methodologies and technology to make AI responsible and/or Ethical. These issues touch directly on modelling and simulation and we will discuss the current state of this and its implications. The synthetic data movement proposes champions generating data artificially and championing this as a solution privacy and the high cost of generating real data. These developments obviously could have a major implications for the modelling community.

Lastly, we will discuss the role of humans in the era of machine learning. While machines can learn from data and make predictions, they cannot replicate human intuition, creativity, and empathy. We will explore how human-machine collaboration can lead to better models and more ethical and responsible use of data.

**Keywords:** *Machine learning, artificial intelligence*