St Catherine's College has a long tradition in applied and industrial mathematics and has hosted an annual series of lectures on Mathematics and its Applications since 1986. In 1995, the series was renamed in memory of Alan Tayler, in tribute to his efforts and achievements in this field. Alan was the first Fellow in applied mathematics to be appointed at St Catherine's. His lifelong commitment was to the practical application of mathematical ideas to problems in science and industry. His vision continues to inspire many national and international collaborations on the theme of mathematics-in-industry.

The Smith Institute for Industrial Mathematics and System Engineering provides system-level thinking underpinned by the mathematical sciences, combining academic excellence with business understanding. We enable companies and government to improve products, processes, services and strategy through the application of cutting-edge mathematical thinking. Alan was a founding member of the Institute's Council in 1993. The Institute benefited greatly from his energy and vision and we are delighted to support the annual Alan Tayler Lecture.

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St Catherine's College, Oxford

The Alan Tayler Lecture

Transforming Medicine Through Machine Learning and Artificial Intelligence

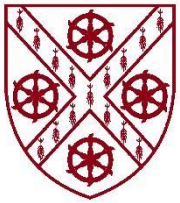
Prof Mihaela van der Schaar

University of Cambridge / Alan Turing Institute / UCLA

Monday 11 November 2019

Bernard Sunley Lecture Theatre

The Alan Tayler Lecture 2019



Mihaela van der Schaar

Professor Mihaela van der Schaar is John Humphrey Plummer Professor of Machine Learning, Artificial Intelligence and Medicine at the University of Cambridge, a Turing Faculty Fellow at The Alan Turing Institute in London, where she leads the effort on data science and machine learning for personalized medicine, and a Chancellor's Professor at UCLA. Prior to this, she was MAN Professor of Quantitative Finance at University of Oxford. She is an IEEE Fellow (2009). She has received the Oon Prize on Preventative Medicine from the University of Cambridge (2018). She has also been the recipient of an NSF Career Award, 3 IBM Faculty Awards, the IBM Exploratory Stream Analytics Innovation Award, the Philips Make a Difference Award and several best paper awards, including the IEEE Darlington Award. She holds 35 granted USA patents. Recently NESTA has identified her as the female researcher based in the UK with the most publications in AI.

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Transforming Medicine Through Machine Learning and Artificial Intelligence

Machine Learning and Artificial Intelligence are set to transform healthcare. My group, Machine Learning and Artificial Intelligence fo Medicine (ML-AIM), is developing new, cutting edge theories, metho and algorithms specifically tailored to the needs of medicine, rather than applying off-the-shelf, generic ML and AI techniques which ofte do not prove very useful in practice. To help structure and think abou our approach, we have identified five main challenges:

(1) Lifestyle optimization and disease prevention;
(2) Disease detection and prediction of disease progression (longitudinal);
(3) Identification of best interventions and treatment plans;
(4) State-of-the-art tools for clinicians & healthcare professionals to deliver high-quality care;
(5) Optimization of healthcare systems (quality, efficiency, cost effectiveness, robustness, scalability).

My group is working on addressing all these challenges by developir new and targeted machine learning and AI methods.

In this talk, I will present our research results in three main areas:

- Building a comprehensive time-series model that accommodates irregularly sampled, temporally correlated, informatively censored and non-stationary processes in orde to understand and predict the longitudinal trajectories of diseases.
- Establishing the theoretical limits of causal inference and usir what has been established to create a new approach that makes it possible to better estimate individualized treatment effects.
- Developing systematic and general methods for making machine learning algorithms interpretable and their prediction easily explainable.