WORKSHOP ON ENERGY, DATA AND MODELLING

18th September 2020, 13:00 – 17:00, Online

We look forward to welcoming our speakers to a workshop exploring research on energy data; the technical challenges and potential for impact.

13:00		**Welcome** with David Howey, Oxford Engineering Science
13:10		**Erica Thompson** Decolonising Model Land: a provocation
14:00		**Ayrton Bourn:** Winds of Change: Computer Vision for Power Forecasting
14:50		**Break**
15:00		**Eric Hittinger** Trying to figure out how energy storage affects electricity systems
15:50		**Jack Kelly** Linked Data for the Energy System
16:40		**Closing Discussion**

Decolonising Model Land: a provocation

Erica Thompson, Centre for the Analysis for Time Series, LSE

Biography: Erica Thompson is a Senior Policy Fellow and co-Director of LSE's Centre for the Analysis of Time Series. A mathematician and physicist by training, she has a PhD in climate modelling and now works on the use and interpretation of mathematical models for decision support. Her research interests centre around quantitative and qualitative ways to "escape from model land" - to take outputs from mathematically-idealised calculation of models and translate them into statements about the real world. This involves disentangling statistical, physical, and psychological bases for confidence in the reliability and actionability of model-based evidence. Erica is also a Fellow of the London Mathematical Laboratory, where she leads the programme on Inference from Models.

Abstract

What are the assumptions that we build into our models, and how do they result in inadequate characterisation of uncertainty?

First example: if you make an energy system model and put "negative emissions technology" in your model at an arbitrary price of $150/tonneCO2 then of course any least-cost pathway will make use of it. But what if you were to put in "social behaviour change technology" at the same cost?

Second example: if you make a climate model that has grown out of the study of the fluid dynamics of the atmosphere, it will treat the biosphere as an uncertain second-order sub-routine, which can even be ignored by taking "Representative Concentration Pathways". But what if you were instead to begin from first principles with a model of the biosphere, treating the atmospheric dynamics as an uncertain second-order subroutine?

Third example: if you make an S-E-I-R epidemic model that takes short-term morbidity and mortality (and maybe immunity) as the metric of success or failure, then it will always recommend "lockdown" policies. But what if you were instead to create a model which centres the long-term mental health of a population?

In practice, the models that inform these kinds of decisions are constructed according to the ideas and preferences of a certain demographic of people: generally wealthy, educated, techno-optimist, mobile, high-consumption, unwilling to change their own lifestyle, etc etc.... and so the policy options and preferences that are generated tend to reflect that: reliance on technology, little or no behaviour change for that group (though it will likely be expected of others), representation of wellbeing as $$ consumption levels, convergence on "western" levels of consumption etc. Similarly, the predict-and-optimise approach is based on a dominating, macho style of interaction with the world which assumes that values are singular and scalar (usually $$), complex processes can be controlled, uncertainty reduced, risks taken and always won.

I propose a democratisation and decolonisation of model land by systematic evaluation of these assumptions, and the construction of a more pluralist suite of models to inform high impact decision-making. That involves reframing the questions we are really trying to answer by generating this kind of model, acknowledging that all models are value-laden, demoting models to their rightful place as one source of information among many, and beginning the real work of

generating consensus about values: what do we (all of us!) really want the next century to look like?

Winds of Change: Computer Vision for Power Forecasting

Ayrton Bourn, UCL Energy Institute

Biography: Ayrton Bourn is a PhD student at the UCL Energy Institute, researching AI & ML techniques for wind power operation optimisation. After obtaining his first degree in Chemical Engineering from the University of Sheffield he moved to UCL for a Masters in Energy Systems with Data Analytics, where he has continued with his PhD in the Energy Systems & AI Lab. Within industry Ayrton has worked on a number of data science projects with UK wind farm developers, ranging from siting to power now-casting.

Abstract
This talk will cover why certain applications of AI became early 'wins' within the wind power sector, the current advances that are entering the field, and the more long-term trends that are likely to emerge. Whilst covering a wide range of AI applications within the sector, the main focus of the talk will be on recent work applying causal computer vision techniques to wind power forecasting.

Trying to figure out how energy storage affects electricity systems

Eric Hittinger, Rochester Institute of Technology & University of Lille

Biography: Dr. Hittinger is a Visiting Professor at the Laboratoire d'électrotechnique et d'électronique de puissance (L2EP) at the University of Lille (France) and Associate Professor of Public Policy at Rochester Institute of Technology, with active research projects on techno-economics of energy storage, renewables, electric vehicles, and energy systems. His work generally focuses on current and near-term application of new technologies and interactions between economics, policy, and technology.

Abstract: Energy storage is poised to become a rapidly growing participant in electricity systems, yet we are still trying to figure out what will happen when it does. While some answers are clear even without analysis - storage works well with solar and wind and competes with peaker plants - the magnitude of these effects requires careful study. Other questions are more uncertain: How does new energy storage change the operation of existing generators and what is the net effect on emissions? This presentation summarizes our work on the near- and mid-term effects of new energy storage on US electricity systems and discusses some of the relevant issues relating to modeling perspectives, system dynamics, and policy interactions.

Linked Data for the Energy System

Jack Kelly, Open Climate Fix

Biography: Jack is a computer scientist who is terrified by climate change. He did a PhD on using machine learning to disaggregate domestic electricity demand. Then he worked at Google DeepMind on forecasting wind power production. In early 2019, Jack left DeepMind to co-found Open Climate Fix, a non-profit focused on using open science to mitigate climate change. Jack also spends half his time consulting for National Grid Electricity System Operator (ESO) on using ML to predict renewable generation.

Abstract: Data is increasingly important to the energy system. But, today, it is surprisingly hard to find, interpret or combine energy data. If the energy system is to reduce emissions to net-zero, then we need to significantly reduce this friction. As a community, we need to figure out how to enable machine-to-machine communication in a hugely complex network, in near-real-time, whilst ensuring the system as a whole never fails even though individual devices often will; and we've got to do this on the back of a system that was mostly built decades ago. Ultimately, what's needed is a distributed digital representation of the structure of the energy system and its dynamical state. A representation that machines can reason about, in order to optimise locally (to reduce energy bills for domestic users) and optimise globally (to balance supply and demand). And this representation must be easy to combine with digital representations of other parts of our infrastructure (such as water, transport, and land-use) to support the effort to build a National Digital Twin. In this talk, we will examine whether "linked data" could provide a digital representation of the energy system that ticks all these boxes.

Please contact Ralph Lane to register:
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