

# Programme for RSS 2020 Online conference

09:45 – 10:00 (Day 1, Monday 7 September)

## Welcome to Conference

Kim Kavanagh (RSS Honorary Officer, Conferences & Events) and Dave Woods (RSS 2020 Conference Programme Chair) welcome attendees to the conference.

10:00 – 10:50 (Day 1, Monday 7 September)

## Keynote 1 - Champion (President's Invited) Lecture: Deriving Insights from New Data Sources

Presented by: **Kerrie Mengersen** - Queensland University of Technology

One of the major opportunities – and challenges – facing statisticians and data scientists is the diversity of new data sources. These data motivate an expansion of traditional approaches to statistical modelling and encourage new lines of analysis. In this presentation, I will discuss some of our adventures in analysing and integrating data derived from virtual reality, thermal imagery, satellites and crowdsourcing, primarily in the context of conservation.

11:10 – 12:30 (Day 1, Monday 7 September)

## Active learning for undergraduate statisticians

In universities, mathematics pedagogy often follows a very traditional didactic model. More modern approaches are taking hold throughout the sciences, with active learning as a strong component. Recent guidelines on teaching statistics from the ASA include active learning as an example of best practice.

The speakers will draw on their experience of active learning in statistics for undergraduate students of the mathematical sciences, providing examples of successful implementations. The aim is to share best practice and stimulate discussion about future directions

*Active assessment to enable students to close their own feedback loop*

**Alison Poulston** (University of Sheffield)

*Learning by discovery in statistics*

**Chris Hallsworth** (Imperial College)

*Active learning in live online teaching*

**Elinor Jones** (UCL)

## RSS Prize Winners: Best presentations from YSM 2020

Come and hear the winning presentations from the Young Statisticians Meeting 2020 which took place online in July.

*Exploring the use of Bayesian techniques in a surgical trauma randomised control trial*

**Alexander Ooms** (University of Oxford)

*A flexible multiplicative marginal rate model for gap times between recurrent events*

**Ivo Sousa-Ferreira** (University of Lisbon)

*Natural history models for breast cancer growth and spread*

**Alessandro Gasparini** (Karolinska Institute)

### **Wasn't Synthesis just in the '80s? A chat about modern day synthetic data**

*Synthetic Data and the Data Landscape in Scotland*

**Albert King** (Chief Data Officer, The Scottish Government)

*The challenges of measuring the quality and privacy protection of synthetic data*

**Jörg Drechsler** (Department of Statistical Methods, IAB)

*Experimental Synthetic Data System for Medical Data*

**Euan Gardner** (Senior Information Development Manager, NHS Scotland)

13:00 – 14:20 (Day 1, Monday 7 September)

### **Interactive visualisation using dashboards**

Interactive data visualisation has transformed the way data can be presented for effective story telling. R packages such as Shiny and Markdown empower users with the ability to get real value from large amounts of data. This session provides some insight into the world of dashboards using RShiny.

Speakers:

**Edward Parker** (Research Fellow at London School of Hygiene & Tropical Medicine)

**Aidan Boland** (Senior Data Scientist at Edge by Ascential)

### **RSS Professional Pathways: How professionalism can help you career**

How and why should you become a professional member of the RSS?

In this session we will outline the changes the RSS have made to the new professional pathway in recognition of a modern-day statistician.

Speakers will provide information and share their own experiences of the application process for all stages of the new professional pathway; Data Analyst, GradStat, and CStat.

14:35 – 15:55 (Day 1, Monday 7 September)

### **Bayesian Demography**

Population estimation and forecasting is a vital function of official statistical bodies, with implications for many areas of public policy. Population models are typically composed of

separate models of mortality, fertility and migration. In order to make decisions on the basis of the estimates and forecasts arising from such models, quantification of the corresponding uncertainty is essential. Bayesian methods are well suited for this task. This session will feature presentation of contemporary Bayesian approaches to forecasting all three components of population change.

*Capturing basis risk in insurance books: a Bayesian model for portfolio and population mortality*  
**Katrien Antoinio** (KU Leuven)

*Forecasting fertility with Bayesian parametric mixture models*  
**Jason Hilton** (University of Southampton)

*Bayesian analysis of agent-based models for migration*  
**Jakub Bijak** (University of Southampton)

*Bayesian demographic accounts*  
**John Bryant** (Independent Consultant at Bayesian Demography)

### **Ethics & Bias in Data Science**

The speakers will explore issues associated with bias in artificial intelligence and data science and methods for mitigating and overcoming bias with a view to a more ethical use of data.

*Getting comfortable with being uncomfortable and uncertain*  
**Sophie Carr** (Bays Consulting)

*Sex and gender in statistics – how we collect, publish and use this data to promote equality and diversity*  
**Roger Halliday** (Chief Statistician, Scottish Government)

*Developing software solutions to mitigate unintended biases in algorithms*  
**Raluca Crisan** (Merkle Aquila and Etiq AI)

### **Stats+Stories: Live at RSS 2020**

The Stats + Stories podcast comes to RSS 2020. Join host John Bailer for debate and discussion on “the statistics behind the stories and the stories behind the statistics”. Featuring guests **Tim Harford**, author and presenter of BBC Radio 4’s More or Less, who will explain his “rules for thinking differently about numbers”; and **Timandra Harkness**, presenter, writer and comedian, who will talk about the misunderstanding of risk and the challenge of Covid-19.

16:10 – 17:00 (Day 1, Monday 7 September)

### **Keynote 2 - Statistics and the Media in the Time of Covid: trying to communicate about an epidemic of data**

Presented by: **Sir David Spiegelhalter** - University of Cambridge

09:45 – 10:00 (Day 2, Tuesday 8 September)

## **Welcome to Day 2**

Christl Donnelly (Chair of the RSS Florence Nightingale Bicentenary Planning Group) previews today's conference programme.

10:00 – 10:50 (Day 2, Tuesday 8 September)

## **Keynote 3 - Statistics for the Public Good**

Presented by: **Sir Ian Diamond** - National Statistician

The COVID-19 pandemic has reinvigorated the necessity for data driven decision making. At the same time, it has called for greater innovation and collaboration in order to provide timely insights into complex, multidisciplinary issues. This presentation shall focus on how the Government Statistical Service (GSS) has had to adapt at pace in order to understand, mitigate and monitor the impact of COVID-19 on society and the economy. As well as this, the presentation will explore how the opportunities that have presented themselves over the course of the pandemic can be built upon through the launch of the new GSS strategy, Statistics for the Public Good, which will govern all that we do for the next five years and beyond.

11:10 – 12:30 (Day 2, Tuesday 8 September)

## **Challenges and advances of spatial modelling in ecology**

As the technology with which we collect ecological data develops, the spatial and temporal resolution (as well as sheer quantity) of data allows ecologists to tackle new, hitherto unsolved questions. Ecological data produced by new technologies are often messy (e.g. irregular spatio-temporal resolution) and so cutting-edge statistical developments are required to deal with these data appropriately. Statistical developments need to react to this changing environment and develop more complex modelling approaches which can harness data collected with these technologies. In this session we present four new developments in spatial modelling from members of the National Centre for Statistical Ecology. In particular David Miller will talk about the stochastic partial differential equation approach to smoothing, Esther Jones will present work on fitting spatial point process models to tracking data, Oscar Rodriguez de Rivera will address the importance of spatio-temporal modelling in ecology and Alex Diana will show how it is possible to estimate interactions between and within more than two species in capture-recapture data using point processes.

The session will conclude with a discussant, Professor Janine Illian (University of Glasgow) who will outline the current open questions facing spatial modelling in ecology.

*The Importance of spatio-temporal modelling in Ecology*

**Oscar Rodriguez de Rivera** (Kent)

*The Challenges of fitting spatial point process models to tracking data*

**Esther Jones** (BioSS)

*Understanding the stochastic partial differential equation approach to smoothing*

**Richard Glennie** (St Andrews)

*Interaction point processes in spatially explicit capture-recapture models*

**Alex Diana** (Kent)

**Janine Illian** (Glasgow) - Discussant

### **Statistical Knowledge Transfer Partnerships**

Knowledge Transfer Partnerships (KTPs) are collaborations between Universities and businesses to help academic expertise find its way into the business world. Partly funded by the UK government, individuals are jointly recruited by the University and business involved to be KTP Associates. They typically work embedded in the business while being formally employed by the University which also provides academic staff to guide the technical aspects of the work.

In this session we hear from KTP Associates about the projects with which they have been involved.

- Statistical models to predict patient engagement and effective treatment pathways.
- Developing mathematical modelling and simulation to enhance forecasting accuracy and strategic decision making.
- Statistical models and decision support for personalised advert and content delivery.

Speakers:

**Alice Davis** (University of Bath/Mayden House)

**Ed Ryan** (University of Manchester/Arrow Global)

**Ryan Jessop** (Carbon) with **Elaheh Oftadeh** (University of Durham/Carbon)

### **Statistics, communication, impact: the Florence Nightingales of today**

Florence Nightingale may have been the first person to use statistical graphs for popular impact and to influence policy, ultimately saving patients' lives. In this session we will explore some current methods of data visualisation, how these are perceived, and the impact they have. Applications in the area of human health will be discussed.

*A passion for measurement*

**Martin Bland** (University of York)

*Communicating statistics in the age of short attention spans*

**Federica Cocco** and **John Burn-Murdoch** (The Financial Times)

*Visualising data during a pandemic*

**Robert Fry** (Interactive Data Manager ONS)

13:00 – 14:20 (Day 2, Tuesday 8 September)

### **Bite-sized Data Science for Government**

The UK government has the ambitious to have one of the most digitally skilled workforce in the world. ONS Data Science Campus plays a key role in this strategy. Created in 2016 and now with 70 staff across 4 hubs in England, Wales and Scotland, the Campus is a research and development centre of excellence in Data Science and AI for public good. With a dedicated Knowledge Exchange Division, the Campus builds leading-edge analytical skills in the public sector with national and international partners. This workshop showcases the Campus Learning and Development training programme through three bite-sized short courses on fundamental topics of AI for government, including impactful applications of data science in government, discussions about causal inference and machine learning and how to adopt a reproducible mindset in data science processes.

*Art of the Possible with Data Science*

**Laurie Baker** (ONS Data Science Campus)

*Data Science and Causal Inference*

**Kaveh Jahanshahi** and **Saliha Minhas** (ONS Data Science Campus )

*Reproducibility and Transparency*

**Richard Leyshon** (ONS Data Science Campus)

### **The art of blended and virtual learning in statistics and data science – insights from coronavirus quarantine**

When learning about difficult or complex concepts, such as those involved in data science and statistics, research indicates that the best approach is through peer discourse. However, strategies for implementing this is not straightforward, particularly in online learning environments.

It is for this reason that in-person and online teaching often fails to engage in active peer dialogue.

Presenters:

**Morgan Yarker** (Yarker Consulting, USA; YCOMM, USA; Calumet College of St. Joseph, USA)

**Meena Kotecha** (London School of Economics, UK/ University of Cambridge, UK)

**Michel d. S. Mesquita** (M2Lab.org Centre for Statistical and Data Science Research, Norway; YCOMM, USA SKL, Norway)

**Matthew J. Benus** (Calumet College of St. Joseph, USA)

### **Developing quality and uncertainty frameworks: From concepts to application in official statistics**

Combining new sources with surveys will allow us to meet the ever-increasing user demand for improved and more detailed statistics. The Office for National Statistics (ONS) and Statistics Canada, like many National Statistics Organisations, are committed to increasing the use of administrative data in the production of official statistics.

However, using these data, and integrating or linking with traditional survey or census data, involves addressing a range of statistical challenges. These data are not collected for statistical purposes, and so it is not straightforward to produce measures of uncertainty for published estimates.

Methodologists, and the wider statistical community, need to enable a paradigm shift in the production of official statistics, ensuring that the methods used on administrative, big, and integrated statistics are transparent, reproducible and of high quality.

This session focuses on the frameworks being developed internationally to measure and communicate quality and uncertainty. We will take our audience on a journey to explore the challenges of the practical application of theory and best practice. Recent developments of frameworks for the use of new data in official statistics will also be presented by Canada and the UK.

Speakers:

**Susie Fortier** (Statistics Canada)

**Sarah Cummins** (Office for National Statistics)

**Adriana Castaldo** (Office for National Statistics)

**Nicky Rogers** (Office for National Statistics)

### **Florence Nightingale and her colleagues: using statistics to save lives**

This talk will explore the lessons Nightingale and her colleagues learned from the Crimean War, compare her/their analysis with that of the official Army Medical Department report, and go on to show how she/they used statistical analysis in other areas: the peacetime British Army, nurse deaths in hospitals, maternal deaths post-childbirth, deaths in Indigenous residential schools, deaths from “Contagious Diseases” (STD) review of Poor Law institutions, need for good population data on health and housing, on to evidence-based health care .

Speaker:

**Lynn McDonald**, University of Guelph, Canada  
Director, Collected Works of Florence Nightingale

### **Statistics and measurement science**

Metrology, the science of measurement, is little known in the Statistics community, and yet the “Guide to the Expression of Uncertainty in Measurement” (the GUM) is probably the most widely read and used statistics text of all time. The statistical methods it describes are used to quantify uncertainty in measurements and calibrations thousands of times every day, everywhere from

small laboratories throughout the world to the National Metrology Institutes (such as the UK's National Physical Laboratory).

This session will introduce metrology, the GUM and the underlying concepts. Challenges in measuring quantities with values close to zero, with appropriate expression of uncertainty, will be presented. Limitations of the GUM will also be highlighted, and a new framework proposed.

*The Guide to the expression of uncertainty in measurement: origins and development*  
**Maurice Cox**, National Physical Laboratory

*The edge of reason: values, and uncertainties near zero*  
**Stephen Ellison**, LGC

*Meaningful expression of uncertainty in measurement*  
**Anthony O'Hagan**, University of Sheffield

### **Statistics in the water industry**

Join us to explore how the use of data and statistical insight and modelling is helping to transform the water sector. This session will look at the ways in which some of societies highest priorities for the water sector – continuous supply, high quality drinking water and low levels of leakage – are being enabled by data scientists and statisticians.

*Developing predictive tools and anomaly detection from meter data to improve leakage performance*  
**Joshua Pocock** (South West Water)

*Statistical analysis of non-household consumption and the impact since COVID-19*  
**Francesca Cecinati** (Artesia Consulting)

*Forecasting water demand – how focus changes between longer-term and shorter-term requirements*  
**Mark Kowalski** (Water Research Centre)

16:10 – 17:00 (Day 2, Tuesday 8 September)

### **Keynote 4 - Significance Lecture: The Legacy of Scientific Racism**

Presented by: **Angela Saini**

Racial categories feel tangible, but as we know from genetics, anthropology and history, they are no more rooted in biology than they were hundreds of years ago when they were arbitrarily invented by European scientists affected by the politics of their time. The work of many of history's celebrated statisticians was rooted in eugenics and race science. Angela Saini, author of *Superior: The Return of Race Science*, explores how modern-day researchers should understand and reflect on this legacy, and ensure that the mistakes of the past don't continue into the future.

09:45 – 10:00 (Day 3, Wednesday 9 September)

## Welcome to Day 3 - Panel discussion on exam grading algorithms

**Stian Westlake**, RSS Chief Executive, will chair a short discussion on the recent 'A-level exams fiasco' in the UK.

Panellists:

- **Paula Williamson**, Professor of Medical Statistics, University of Liverpool
- **Guy Nason**, Professor of Statistics, Imperial College London
- **Sharon Witherspoon**, RSS VP for Education and Statistical Literacy and Director of Policy at the Campaign for Social Science

10:00 – 10:50 (Day 3, Wednesday 9 September)

## Keynote 5 - Barnett Lecture: Biodiversity matters

Presented by: **Byron Morgan** - University of Kent

Regular reports on the States of Nature and of Birds, Butterflies etc., provide changing pictures in the natural world, for example through the presentation of species indicators. Such multi-species indicators across large geographical scales play a vital role in the assessment of changes in biodiversity. They summarise the trends of sets of individual species in ways that both inform the public and can be used to determine policy.

In this talk we describe the underpinning data and the models that result in the species indicators. Models may describe either abundance or distribution. They can be static, describing individual years separately, or dynamic, including descriptions for changes between years. Dynamic models are fitted to data sets spanning multiple years; they contain additional parameters, potentially describing factors such as survival, movement, productivity and phenology.

We present a variety of new methods developed in collaboration with a wide range of scientists and statisticians, for determining individual species trends, exploring these for heterogeneity and then summarising behaviour through multi-species indicators for sets of similar species.

The approaches have widespread application, and are illustrated using data from extensive UK national butterfly, moth, dragonfly and bat databases.

11:10 – 12:30 (Day 3, Wednesday 9 September)

## Climate Change

Climate change is global challenge impacting all aspects of our environment. Statisticians contribute to climate change research in a variety of areas, including climatology, decision support, detection and attribution, downscaling, extreme events, forecast evaluation, impact assessment and predictability.

In this session, we explore the UK Climate Projections, and uncertainty quantification for glaciology.

Speakers:

**David Sexton** (Met Office)

**Tamsin Edwards** (Kings College London)

### **Educational Inequalities: Beyond COVID**

Educational inequalities in the UK are stark and long standing: children from lower income households have far lower levels of achievement and the gap in achievement between rich and poor has not narrowed substantially over the last decade. The current pandemic is likely to exacerbate these inequalities still further. In this session, Professors **Simon Burgess** and **Anna Vignoles** will discuss the ways in which COVID-19, or more specifically our policy response to COVID-19, will worsen educational inequalities and what policies might mitigate this.

### **Tutorial on causal inference with point exposures: potential outcomes in action with heads on competition of methods.**

Many methods exist for causal inference for point exposures. This session will explore where they differ and overlap in target estimand, needed key assumptions, sensitivity to imperfect regression models, and data hungriness. This session will also introduce a new online learning tool in which many of these methods can be compared head on and with gold standard causal effects. It will end by demonstrating the potential for innovative methods and finding from the Swedish National Disease register.

*Introducing to a tutorial on causal inference for point exposures*

**Bianca de Stavola** (University College London, UK)

*An online simulation learner for causal effect estimation: generating a range of possible exposures and their potential outcomes per subject*

**Saskia le Cessie** (Leiden University, Netherlands)

*Trial emulation in the long-standing National Swedish Kidney registry: causal inference and challenges of transportability*

**Ingeborg Waernbaum** (Uppsala University, Sweden)

13:00 – 14:20 (Day 3, Wednesday 9 September)

### **Getting your work published**

Are you looking to get your work published? Or do you want to raise the profile of your published work? The session, jointly organised with Wiley, will provide valuable advice for writing journal and magazine articles, give an overview of article review processes, and explore available self-promotional tools to raise the visibility of your work or research.

Speakers:

**Aurore Delaigle** (University of Melbourne)

**Brian Tarran** (Editor Significance)

**Stephen Raywood** (Wiley)

**Jouni Kuha** (LSE)

## **Statistical consultancy: advice for going it alone**

Statistical consultants supply expert advice, deliver statistical analysis, and provide training to individuals, organisations and businesses. There are many different types of consulting, each with benefits and difficulties. While this variety may encourage many into the field, it can also make the leap into consultancy seem daunting for young statisticians.

Our panel of expert consultants are on hand to share their experiences, give advice, and demystify the process of starting out as a statistical consultant.

Panel:

**Sophie Carr** (Bays Consulting)

**Albert Chau** (Datacision Limited)

**Rhian Davies** (Jumping Rivers)

**Marie Oldfield** (Oldfield Consultancy)

14:35 – 15:55 (Day 3, Wednesday 9 September)

## **Reporting on sustainability in turbulent times**

Sustainable development – social, environmental and economic – is at the heart of development efforts in countries all around the world, and progress is being monitored with a set of goals, targets and indicators, which have been globally developed and are nationally owned.

In this session we shall see how the Covid-19 pandemic has made it even more important to have a coherent and consistent set of indicators across all sectors which allow us to monitor the effects of this challenging situation.

*The Sustainable Development Goals: Friend or Foe of Statisticians?*

**Johannes Jütting** (OECD-PARIS21)

*Moving beyond headline reporting to achieve sustainability*

**Fiona Dawe** (ONS)

*Measuring the well-being of Wales – supporting sustained action for the well-being of future generations*

**Sue Leake** (Welsh Government)

*Measuring sustainable development in Myanmar*

**Matthew Powell** (UNDP and RSS IDS)

## **Statistical Excellence Award for Early Career Writing 2020**

Significance magazine and the RSS Young Statisticians Section invite you to join this special session of conference, celebrating the 2020 winner of the Statistical Excellence Award for Early Career Writing. Hear a talk from Maria Ibrahim, clinical research fellow, NHS Blood and Transplant based on the winning article and take part in the discussion that follows to find out more about the competition and what's required to craft a successful entry. Plus, award judge

and RSS Stats Ambassador Joy Leahy shares advice on “how to make statistics fun, interesting and accessible for everyone”.

### **Target trial emulation**

While randomised controlled trials are considered the gold standard for estimating treatment effects, they are often not ethical, practical, or timely. The target trial emulation framework (Hernan and Robins 2016\*) provides a structured process for valid estimation of treatment effects using observational data. This session will address both methodological challenges and applications of the target trial emulation framework.

*Emulation of a target trial to investigate the impact of lung transplant on survival in cystic fibrosis*  
**Ruth Keogh** (LSHTM)

*Methodological challenges in emulating target trials*  
**Bianca de Stavola** (UCL)

*Emulating target trials using cancer registry data in the presence of immortal-time*  
**Clemence Leyrat** or **Camille Maringe** (LSHTM)

### **Work and gender**

In this session, we will explore gender differences in work and industry. We will discuss the use of name-gender inference in understanding global patenting activity of female inventors; an investigation of how the impact of hourly pay and commuting time on reasons for job separation differs between men and women; and how data from the UK Household Longitudinal Study describes how contemporary British couples divide a range of work types.

Speakers:

**Anne McMunn** (UCL)

**Pauline Beck** (IPO)

**Vahe Nafliyan** (ONS)

16:15 – 18:15 (Day 3, Wednesday 9 September)

### **Keynote 6 - Discussion Meeting: Testing by betting: A strategy for statistical and scientific communication**

Presented by: **Professor Glenn Shafer** - Rutgers University

The most widely used concept of statistical inference — the p-value — is too complicated for effective communication to a wide audience. This paper introduces a simpler way of reporting statistical evidence: report the outcome of a bet against the null hypothesis. This leads to a new role for likelihood, to alternatives to power and confidence, and to a framework for meta-analysis that accommodates both planned and opportunistic testing of statistical hypotheses and probabilistic fore-casts. This framework builds on the foundation for mathematical probability developed in previous work by Vladimir Vovk and myself.

09:45 – 10:00 (Day 4, Thursday 10 September)

### **Welcome to Day 4**

RSS President Professor Deborah Ashby will outline four steps that the RSS will take to fight racism and discrimination, and to promote equality, diversity and inclusion.

10:00 – 10:50 (Day 4, Thursday 10 September)

### **Keynote 7 - The past, present and future of capture-recapture**

Presented by: **Professor Ruth King** - University of Edinburgh

The use of capture-recapture techniques for estimating hidden population sizes has a long history, dating back to at least the 1600s. I will describe a very brief (abridged) history of capture-recapture and the development of associated statistical approaches which have been applied primarily within the areas of ecology and epidemiology. Particular applications range from endangered animals (e.g. tigers/leopards) to people who inject drugs and modern-day slaves. Understanding the data collection mechanism is essential for reliably modelling, and making inference, on the given system under study. I will describe a recent example of this in practice where blindly applying the standard approach leads to unreliable population estimates. I will also describe modern data collection developments that have led to further statistical challenges and discuss some of the associated novel techniques that have been developed to address these issues. Finally, I will conclude with some personal reflections on capture-recapture.

11:10 – 12:30 (Day 4, Thursday 10 September)

### **Choose your own Career: A Data Science Adventure**

This session will focus on the realities of a career in commercial data science. We will use the format of a “choose your own adventure” book to create an interactive session looking at the ups and downs of data science careers. This will be set against the backdrop of ongoing “hype” around terms like AI & Machine Learning that can raise the expectations on data science teams.

**Richard Pugh** (Mango Solutions) will be joined by fellow members of the RSS Data Science Section committee

### **Mind the gap: Causation in law vs statistics**

Approaches of English courts to statistics and epidemiology will be summarised. Gaps between law and statistics in understanding arithmetic versus statistics, risk versus cause, standards of proof for causality, and the relevance of various data sources will be considered. Principles for deciding whether evidence can be used in court, and whom to consider as an expert in causation will be discussed.

*English Courts' Approach to Causation of Ill-Health*  
**Leigh-Ann Mulcahy** (QC, Fountain Court Chambers)

*The Rise of Vaccine Hesitancy and Causal Uncertainty: Reducing the Legal, Scientific and Public Disconnect*

**Richard S. Goldberg** (Durham Law School, University of Durham)

*Causation in statistics: Tools to formalize and analyse legal arguments*  
**Maria Cuellar** (Criminology Department, University of Pennsylvania)

### **Political statistics: opinion polling**

Four lectures on the subject of political opinion polling and related statistics:

*Reflections on the 2019 election*  
**Ben Page** (Ipsos)

*Election Polling Errors Across in Cross-National and Longitudinal Perspective*  
**Will Jennings** (University of Southampton)

*Predicting likelihood to vote – assessing model validity using the 2017 and 2019 UK general elections*  
**Luke Taylor** (Kantar)

*Political Opinion Polling with a brief mention of Political Betting*  
**Robert Worcester**

### **Working together to improve migration statistics**

Covering migration statistics developments since re-classifying to experimental and how we are working together to improve the stats and re-classify to National Statistics.

Speakers including:

**Becca Briggs** and/or **Jay Lindop** (Office for National Statistics)

**Bex Newell** (Home Office)

**Yolanda Ruiz Rodriguez** (Department for Work and Pensions)

**Mary Gregory** (Office for Statistical Regulation)

**Denis Kierans** (Migration Observatory)

13:00 – 14:00 (Day 4, Thursday 10 September)

### **Get Involved**

Join us to find out how statisticians of all ages have been volunteering for the RSS and how you may be able to get involved. The session will kick off with a talk about how to get involved in the society's sections and local groups, followed by speakers sharing their experiences volunteering with Statisticians for Society and the African Institute for Mathematical Sciences.

Speakers:

**Amaka Nwagbara** (Royal Statistical Society)

**Kamaryn Tanner** (LSHTM)

**Craig Anderson** (University of Glasgow)

## **How to develop your 'so what' message**

How to develop your technical work and answer the 'so what' questions that inevitably come from the stakeholders. Learn how to gain traction and ways to present your outcomes to gain buy in.

Presenter: **Marie Oldfield** CSTAT CSci

14:30 – 15:50 (Day 4, Thursday 10 September)

## **Latent Class Models: Typologies of Development and Applications' Issues**

*Latent Class Models and Typologies of Development*

**Andrew Pickles** (King's College London)

*Issues on the Applications of Latent Class Methods to Address Heterogeneity in Observational and Experimental Studies*

**Salma Ayis** (King's College London)

## **Political statistics: betting**

Four lectures on the subject of political betting and related statistics:

*Modelling bookmakers data and election outcomes*

**John Fry**

*A comparison of polls and prediction markets in predicting elections*

**James Reade**

*The behavior of betting markets on the night of the EU referendum*

**Thomas Auld**

*Fixed-odds political betting (1963-present)*

**Martyn Hill**

## **Quantifying uncertainty due to discretisation error in numerical computation**

This session highlights the recent development of probabilistic numerical methods. These aim to provide a probabilistic quantification of uncertainty due to discretisation of the mathematical model which, for example, can be naturally combined with other sources of uncertainty in a Bayesian statistical framework. The session will open with a general introduction to the topic before taking a deep dive into the topic of probabilistic approaches to numerical integration. The second half of the session will focus on how probabilistic numerical methods can be used to help solve challenging inference problems based on mathematical models, including a showcase of the latest software packages for probabilistic numerical computation.

This session is made possible with the help of the Lloyd's Register Foundation programme on data-centric engineering at the Alan Turing Institute.

*An Introduction to Probabilistic Numerical Methods*

**Jon Cockayne** (Alan Turing Institute, UK)

*Probabilistic Approaches to Numerical Integration*

**Toni Karvonen** (Aalto University, Finland)

*Opportunities for Probabilistic Numerical Methods in Applications and in Industry*

**Alex Diaz** (University College London, UK)

*Software for Probabilistic Numerical Computation*

**Maren Mahsereci** (Amazon Research, Cambridge, UK)

### **Spreading the word - statistics in the workplace**

Short, non-examined, courses in statistics and allied software for non-statisticians in the workplace has been a growth area. Universities are well placed to drive this growth in a regulated manner. Academic examined courses tend to maximise utilisation of the infrastructure only for relatively short periods of the week and year, being constricted by academic terms and normal hours of engagement with students. This provides a backdrop against which short courses can be interwoven, making full use of rooms and equipment that may otherwise be dormant for periods.

This session will consider some of the issues pertinent to the growth in non-examined short statistics courses.

*Sustaining the market*

**Eirini Koutoumanou** (UCL)

*Evaluation and regulation of short non-examined statistics courses*

**Joanna Lewis** (UCL)

*The need to provide adequate reference material that can be utilised beyond a relatively short contact period*

**Neil Spencer** (University of Hertfordshire)

16:10 – 17:00 (Day 4, Thursday 10 September)

### **Keynote 8 - Digital Twins: The Sense and Statistics**

Presented by: **Professor Mark Girolami** - University of Cambridge

The term Digital Twin refers to the coupling, via measured data, of a system, with a computer model. These systems may be physical such as an aircraft, or socio-technical such as a transportation system or an urban city environment. These technologies are transforming the way business is conducted, government operates, the way we live, transact and work. The seemingly magical way in which our digital assistants such as Alexa seem to know the answers to our questions before we even ask them, the breathtaking engineering feats enabled by Digital Twinning with large scale digital models ranging from gas turbines to whole cities, all underline the speed and effectiveness of this transformation. Yet the very core of what makes all these advances at all possible is data and sound statistical modelling and inferential methodology embedded in the artificial intelligence and machine learning algorithms defining these Digital Twins. This talk will consider some of the advances in Digital Twins and describe the pivotal role Statistical Science is playing in making these contemporary industrial innovations a reality.

**Close of conference**