The Open University Statistics Group

2014 Report

1. Membership

Professor K.J. McConway (Head of Group to March)
Dr C.M. Queen (Head of Group from April)
Miss C. Calvert (from September)
Professor F. Critchley
Dr F. Elfadaly
Dr A.E. Faria
Professor C.P. Farrington
Dr S. Fontanella (from February)
Professor P.H. Garthwaite
Dr R.M. Hilliam
Professor M.C. Jones
Dr A. Noufaily
Dr R. Sabolova (from October)
Dr N.T. Trendafilov
Dr G. Van Bever (from October)
Dr S.K. Vines
Dr Y.G. Weldeselassie (from May)
Dr H.J. Whitaker
Mrs J.E. Williams (to August)

Long-term associates

Dr K.A. Anaya (University of Bath) [Visiting Research Fellow, to July]
Dr D.G. Enki (University of Plymouth) [Visiting Research Fellow, to July]
Professor J.C. Gower [Emeritus Professor]
Dr S. Unkel (Justus-Liebig-Universität Giessen, Ludwig-Maximilians-Universität München, Universitätsmedizin Göttingen, all Germany) [Visiting Research Fellow]

Full-time research students

Mr T.G. Gebru
Ms L. Gunn [joint with Earth Sciences, to July]
Mr O. Oyebamiji [joint with Earth Sciences]
Mr M.Z. Rahman Shabuz (from October)
Mr A.J. Santos (to September)
Ms S. Villers (to September)
Mr Y.G. Weldeselassie (to April)

Part-time research students

Mr A. Gustar [joint with Music, to September]
Mr R. Harris

Visitor

Professor P. Marriott (University of Waterloo, Canada)
2. Introduction

Here is an overview of the considerable and successful activity in Statistics at the Open University in 2014, in both research and teaching.

On the research side, all our usual activities and excellent outputs are described in Section 4 onwards of this report. There are now no fewer than 6 postdoctoral researchers working in the Group (Elfadaly, Fontanella, Noufally, Sabolova, Van Bever, Weldeeselassie). Our efforts formed a substantial part of the Open University’s submission to UoA 10, Mathematical Sciences, of the REF, the outcome of which appears to have been satisfactory.

In the course of the year, members of the Group published 20 papers in refereed journals (see Section 6). Pre-publication papers can be found in our technical report series, at http://statistics.open.ac.uk/technical_reports

The excellence of our new first level 30-point module M140 Introducing Statistics (first presented from October 2013) was recognised by the Open University through one of its coveted Teaching Awards. The award, for Excellence in Promoting Equality, was made to the Module Team of Paul Garthwaite and Karen Vines (chairs), Paddy Farrington, Rachel Hilliam, Chris Jones, Kevin McConway, Heather Whitaker and Jane Williams, and Curriculum Manager Gloria Baldi.

All told, just short of 3500 students were enrolled on the Statistics modules presented for study from dates in 2014 (see Section 3).

We are delighted to be able to report the promotions of Catriona Queen to Senior Lecturer and Nickolay Trendafilov to Reader, and congratulate them on their success.

Our Staff Tutor colleague Jane Williams retired in August after very many years of service at the Open University. Over the years, Jane held various positions both regionally and centrally, several of them senior, as well as being a highly valued member of the Group and of numerous Course/Module Teams in Statistics. Best wishes to Jane for a long and happy retirement. Staff Tutor numbers in Statistics were shortly thereafter replenished (to two) by the appointment of Carol Calvert.

The Statistical Advisory and Consultancy Services continue to run successfully, supporting research in other departments across the Open University. These are co-ordinated by Alvaro Faria, assisted by Paul Garthwaite. Two web pages explain the services:

http://statistics.open.ac.uk/advisory_service,
http://statistics.open.ac.uk/stats_consult

Further information on the Group is available through our general web pages at http://statistics.open.ac.uk.

3. Teaching

Presentation

For the first time, the Group presented six modules of 30 CATS points each with one of them (M140) being presented twice in the year. These, with numbers of students starting the presentations of each course given in square brackets, are:
• **M140** *Introducing Statistics* (Chairs: Vines, Hilliam) [February 756; October 1063]

• **M248** *Analysing Data* (Chair: Faria) [399]

• **M249** *Practical Modern Statistics* (Chair: Queen) [249, yes, really]

• **M343** *Applications of Probability* (Chair: Trendafilov) [403]

• **M346** *Linear Statistical Modelling* (Chair: Whitaker) [357]

• **M347** *Mathematical Statistics* (Chair: Jones) [242].

The first level mathematics modules, **MU123 Discovering Mathematics** and the recently finished MST121 *Using Mathematics*, contain statistical material, MST121 substantially so (roughly one quarter of the module); Jane Williams represented us on the latter Module Team. Kevin McConway contributed in a small way to the presentation of SDK125 *Introducing Health Sciences*.

**Production**

Final touches were put to the new first level module **M140 Introducing Statistics**.

**Qualifications**

Our modules are compulsory components of degrees in **Mathematics and Statistics**, **Computing & IT and Statistics**, **Mathematics and its Learning** and **Economics and Mathematical Sciences**, as well being specified options in certain other qualifications. The Mathematics and Statistics degree was awarded to 109 students in 2014. The undergraduate Diploma in Statistics, no longer available to new students, is still awarded to current students who successfully study **M248**, **M249** and two modules from **M343**, **M346** and **M347** (or their predecessors). The Diploma was awarded to 67 students in 2013. A further 44 students were awarded other joint degrees that include a substantial element of statistics.

4. **Research interests**

The Department is home to three Research Groups:

**Multivariate Statistics**: Critchley (co-ordinator), Faria, Garthwaite, Gower, Jones, Queen, Trendafilov, Vines, Anaya (University of Bath), Cook (University of Minnesota), Marriott (University of Waterloo), Taylor (University of Hertfordshire).

**Bayesian Statistics**: Queen (co-ordinator), Elfadaly, Faria, Garthwaite, McConway, Vines.

**Medical Statistics**: Whitaker (co-ordinator), Farrington, Garthwaite, Hilliam, Noufaily, Vines, Weldeselassie.

Clearly, these three general groupings cover a huge variety of research projects in Statistics. Research also continues, of course, on topics not directly covered by these Research Groups, of which single case studies, distribution theory, robust statistics, time series forecasting, influence analysis and statistics in the media are but a small selection. Strong ongoing collaborations continue in areas such as medicine, psychology, traffic modelling, earth sciences and ecology.

For details, see the publications, talks and other items to follow.
5. PhDs awarded

Leanne Gunn for her thesis  
*The duration of volcanic eruptions: empirical probabilistic forecasting models based on historic eruption data*  
(supervisors: S. Blake, H Rymer (both Environment, Earth & Ecosystems), M.C. Jones and P. Einarsson (U. Iceland))

Andrew Gustar for his thesis  
*The demographics of musical works: a statistical approach to historical musicology*  
(supervisors: D. Rowland (Music) and K.J. McConway)

Alexandre Santos for his thesis  
*Dynamic Bayesian Smooth Transition Autoregressive (DBSTAR) models for non-stationary nonlinear time series*  
(supervisors: A.E. Faria, C.M. Queen and R. Souza (Pontifícia Universidade Católica do Rio de Janeiro))

Sofia Villers for her thesis  
*Measuring orienteers’ performance: a method based on lower rank approximation of asymmetrical matrices*  
(supervisors: K. Vines and K.J. McConway)

Yonas Weldeselassie for his thesis  
*Smooth risk functions for self-controlled case series method*  
(supervisors: H.J. Whitaker and C.P. Farrington)

6. Publications

6.1 Publications in refereed journals


6.2 Book chapters and refereed conference proceedings


6.3 Others


7. Seminars at The Open University

We ran our usual seminar programme with invited speakers. Over the year we heard:

Luigi Ippoliti (Gabriele d’Annunzio University of Chieti-Pescara, Italy) *The offset normal shape distribution for dynamic shape analysis*

Krzysztof Latuszynski (University of Warwick) *The Bernoulli factory, extensions and applications*

Jordan Stoyanov (University of Newcastle) *Intriguing problems from combinatorics, algebra, analysis & probability*

Marc Hallin (Université Libre de Bruxelles, Belgium, and Princeton University, USA) *The double sin of the skew-normal, skew-symmetric families of distributions and Fisher information*
Susan Holmes (Stanford University, USA) *Incorporating multiple tables, trees and networks to analyze the microbiome*

Rajen Shah (University of Cambridge) *Min-wise hashing for large-scale regression*

Antonio Gasparini (London School of Hygiene and Tropical Medicine) *Modelling exposure-lag-response associations*

Stephen Buckland (University of St Andrews) *Model-based distance sampling methods*

Ian Vernon (University of Durham) *Confronting a galaxy formation computer model with conflicting observed data sets: a necessarily subjective Bayesian analysis*

We also ran our eleventh *Annual Research Students’ Research Day*, where speakers were Oluwole Oyebamiji, Ross Harris, Sofia Villers and Tsegay Gebru.

And we held an *internal research morning* at which the speakers were Germain Van Bever, Radka Sabolova, Paul Garthwaite, Sara Fontanella and Chris Jones.

### 8. Conference & workshop papers and posters given

**F. Critchley**

NORDSTAT 2014, the 25th Nordic Conference in Mathematical Statistics, Turku, Finland *Invariant coordinate selection*

One Day Conference on Geometry and Statistics, Bath *When are first order asymptotics adequate? ... a diagnostic*

**F. Elfadaly**

ISBA 2014, Twelfth World Meeting of the International Society for Bayesian Statistics, Cancun, Mexico *On eliciting some prior distributions for probabilities of multinomial models* [poster]

**A.E. Faria**

34th International Symposium on Forecasting, Rotterdam, Netherlands *Dynamic Bayesian smooth transition autoregressive models for non-linear non-stationary processes*

**C.P. Farrington**

Royal Statistical Society Medical Section Meeting on the Self-Controlled Case Series Method, London *Control without controls: genesis, theory, controversy*

**S. Fontanella**

COMPSTAT 2014: 21st International Conference on Computational Statistics, Geneva, Switzerland *Sparse exploratory factor analysis*
P.H. Garthwaite

2nd Subjective Bayesian Meeting, Durham Quantifying expert opinion as a probability distribution

Royal Statistical Society International Conference RSS 2014, Sheffield Analysis for single patient studies: examining a patient’s profile of scores

ISBA 2014, Twelfth World Meeting of the International Society for Bayesian Statistics, Cancun, Mexico Analysis of single patient data and probability matching priors [poster]

T.G. Gebru

COMPSTAT 2014: 21st International Conference on Computational Statistics, Geneva, Switzerland Function constrained sparse linear discriminant analysis

R. Hilliam & J.E. Williams

HEA STEM Annual Learning and Teaching Conference, Edinburgh Bringing statistics to life for a diverse population [poster]

M.C. Jones

Advances in Directional Statistics (ADISTA14) International Workshop, Brussels, Belgium Families of unimodal distributions on the circle

Mathematical Methods in Reliability Joint Research Group Meeting on Probability Distributions and Statistical Models for Reliability and Survival Analysis, Brunel University, Uxbridge Distributions on $R^+$: shape parameters and transformations

7th Trondheim Symposium in Statistics, Selbu, Norway Some parametric families of distributions; connections, comparisons and extensions

7th International Conference of the ERCIM Working Group on Computational and Methodological Statistics (ERCIM 2014), Pisa, Italy Families of unimodal distributions on the circle

K.J. McConway

Statistics in Journalism Practice and Education Conference, Sheffield Statistics and the media: a statistician’s view

Rustat Conference on Risk and the Use and Misuse of Statistics, Cambridge Improving the understanding of risk and the better use of statistics

Royal Statistical Society International Conference RSS 2014, Sheffield Working with the media

A. Noufaily

2nd General Assembly Meeting of Accelerated Development of Vaccine Benefit-Risk Collaboration in Europe (ADVANCE), Barcelona, Spain Risk assessment: progress so far and next steps

Workshop on Mathematical Challenges for Long Epidemic Time Series, Warwick Detection of infectious disease outbreaks from laboratory data with reporting delays
N.T. Trendafilov

7th International Conference of the ERCIM Working Group on Computational and Methodological Statistics (ERCIM 2014), Pisa, Italy *Common principal components estimation: a dynamical system approach*

Y.G. Weldeselassie

35th Annual Meeting of the International Society for Clinical Biostatistics, Vienna, Austria *Non-parametric self-controlled case series method*

### 9. Other seminars and talks given

**F. Critchley**

Université Libre de Bruxelles, Belgium *Computational information geometry: an introduction and overview*

University of Cambridge *Fisher symmetry and symmetric component analysis*

**C.P. Farrington**

Roslin Institute, Edinburgh *Correlated infections – and what they can tell us about disease transmission*

Heriot-Watt University, Edinburgh *Estimation of individual heterogeneity in infections transmission from multivariate serological survey data*

**P.H. Garthwaite**

University of Bristol *Analysis for single patient studies*

**M.C. Jones**

University of Bath *Some parametric families of distributions; what they are and how they compare*

**C.M. Queen**

University of Bristol *Dynamic chain graphs for high-dimensional time series: an application to real-time traffic flow forecasting*

**G. Van Bever**

Université Libre de Bruxelles, Belgium *Advances in invariant coordinate analysis*

**Y.G. Weldeselassie**

University College London *The self-controlled case series (SCCS) method with smooth risk functions*
10. Editorial roles

F. Critchley

- Associate Editor: *Journal de la Société Française de Statistique*

C.P. Farrington

- Editorial Board Member: *Epidemiology and Infection* (to October)

M.C. Jones

- Associate Editor: *Annals of the Institute of Statistical Mathematics*
- Associate Editor: *Journal of the Korean Statistical Society*
- Associate Editor: *Statistical Methodology*
- Associate Editor: *Statistics and Probability Letters* (from October)

K.J. McConway

- Senior Editor/Statistical Advisor: *Endocrine-Related Cancer*
- Senior Editor/Statistical Advisor: *Journal of Endocrinology*
- Senior Editor/Statistical Advisor: *Journal of Molecular Endocrinology*

N.T. Trendafilov

- Associate Editor: *Computational Statistics*
- Associate Editor: *Behaviormetrika*
- Guest Editor: Special Issue on Sparse Methods in Multivariate Analysis, *Computational Statistics*

11. Major grants awarded

F. Critchley

ICMS Workshop grant, Edinburgh, for *Computational information geometry for image and signal processing*: £20,500; co-organiser with CTJ Dodson (Manchester) and Frank Nielsen (Ecole Polytechnique, Paris); workshop to be held 21-25 September 2015.

12. Other activities

F. Critchley

- examined a PhD at the University of Jyväskylä, Finland

C.P. Farrington

- holds a Royal Society Wolfson Merit Award
- is a member of the RSS Honours Committee
- examined a PhD at the University of Strathclyde
P.H. Garthwaite
- joined the RSS Research Section committee
- external examiner for undergraduate statistics courses at the University of Aberystwyth
- examined a PhD at Queen Mary University of London

J.C. Gower
- member of the Sir Ronald Aylmer Fisher Memorial Committee of Great Britain

K.J. McConway
- RSS Vice-president for Academic Affairs and an elected member of the RSS Council
- member of the Council for the Mathematical Sciences
- external examiner for undergraduate and postgraduate statistics and optimisation courses at the University of Birmingham
- external examiner for undergraduate statistics courses at Queen Mary University of London
- member of the South Central Regional Advisory Committee for the Research for Patient Benefit Programme of the NHS National Institute of Health Research (to March)
- member, Natural Environment Research Council Peer Review College
- academic consultant on two more series of the BBC Radio4/OU series ‘More or Less’
- wrote invited comments on statistical aspects of scientific papers for the Science Media Centre
- STEM Ambassador (working with schools and young people to promote STEM subjects), including giving talks at two schools in Wellingborough
- judge for the ‘SET for Britain’ parliamentary poster competition for career-young researchers
- trustee of the Southern England Consortium for Credit Accumulation and Transfer

C.M. Queen
- external examiner for undergraduate statistics and related modules at Birkbeck College, University of London
- examined a PhD at the University of Warwick
R. Sabolova

- visited the University of Turku, Finland

N.T. Trendafilov

- visited the University of Naples "L'Orientale", Italy, Université Catholique de Louvain, Louvain-la-Neuve, Belgium and the University of Osaka, Japan