THE UNIVERSITY OF WARWICK

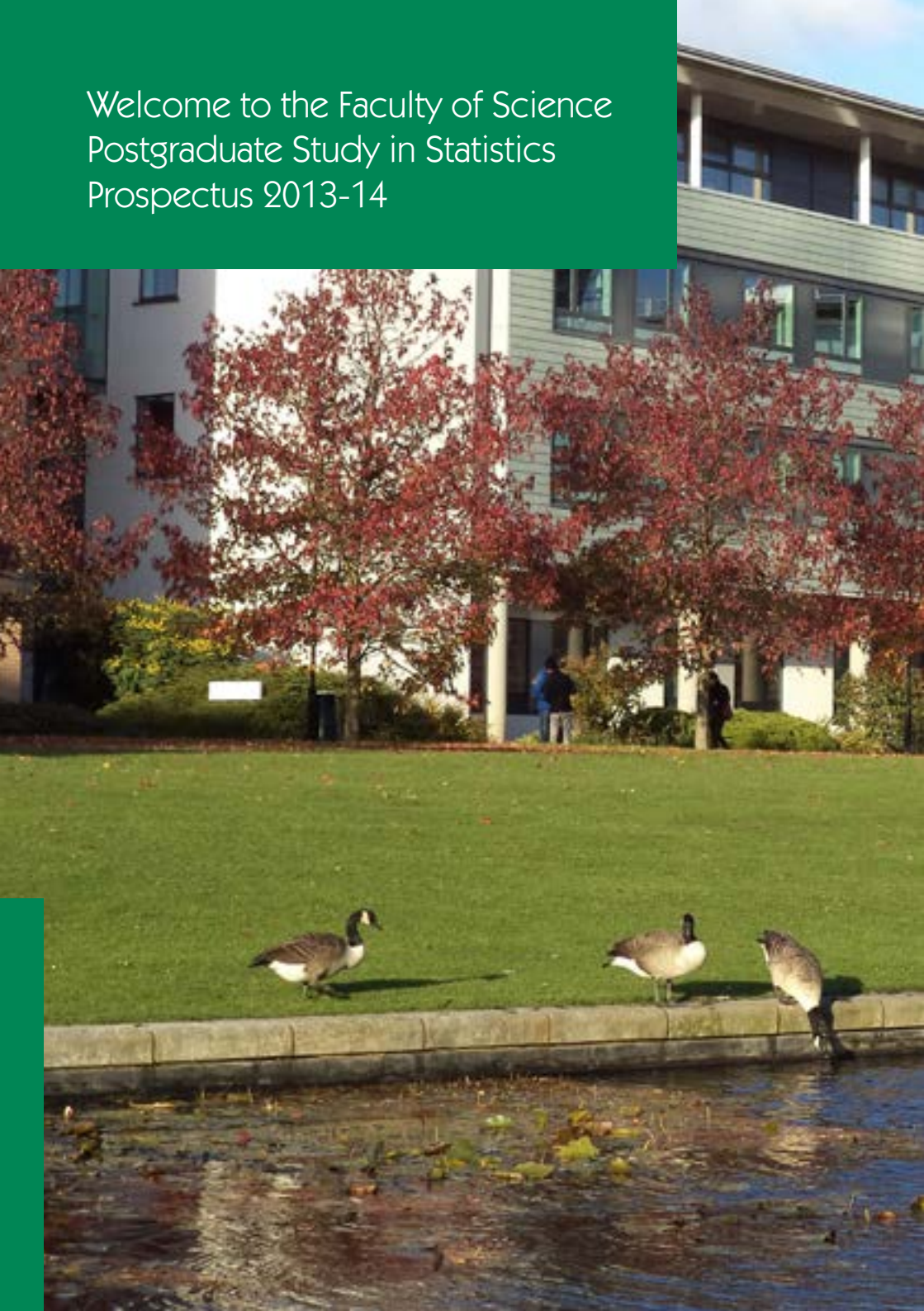
THE UNIVERSITY OF WARWICK FACULTY OF SCIENCE

STATISTICS

PG2013-14

POSTGRADUATE STUDY IN STATISTICS

Welcome to the Faculty of Science Postgraduate Study in Statistics Prospectus 2013-14



Contents

The Department of Statistics

The Department of Statistics is an internationally renowned department in the University of Warwick, one of Britain's leading research universities.

The Department of Statistics has been ranked in the top three Statistics groups nationally on the basis of its world-leading research activity.

The work of the Department covers a wide range of topics in probability and statistics, both mathematical and theoretical aspects as well as applications to many different fields. The research expertise of the staff is reflected in the quality of postgraduate teaching and student supervision, as well as in the wide choice of topics on offer to students for their Master's dissertations or research theses.

The Department is located in the Zeeman Building on Central Campus.

There are computer laboratories; one equipped with high specification PC's for MSc student use.

PhD Students have their own desks with a PC work station. In addition the department has a dedicated computer cluster for computationally intensive work, accessible to PhD students.

Students also have access to a full range of computing facilities on campus and links to outside networks.

Research students are welcome to use the staff common room where they can integrate with staff and visitors in an informal atmosphere. In recent years the Department has contained around 50 research students and 18-40 students on the taught MSc programme.

For further information about the Department staff and students, and up-to-date contact details, see the Department's web-page located at: www.warwick.ac.uk/go/statistics

Centre for Research in Statistical Methodology (CRiSM)

The Centre for Research in Statistical Methodology (CRiSM) is a new research centre at the University of Warwick, initially funded by a £4.1m grant from the UK EPSRC/HEFCE Science and Innovation Awards Initiative. The aim of CRiSM is to promote research into the methodology of statistics, interpreted broadly to include all research which contributes to the understanding and development of statistical concepts and methods.

The Centre is designed to complement our already vigorous research programmes making the Statistics Department at Warwick one of the top centres of research in Statistics in Europe. One of the aims of CRiSM is to provide an environment conducive to an excellent training programme enabling its high quality students to feed the strong demand for statisticians in universities, research initiatives and industry.

Students enjoy a vibrant visitor programme from academics and workers in industry from home and abroad. There is a wealth of topical research seminars and themed workshops to the benefit of the postgraduate community as a whole.

All postgraduate students are supported and encouraged to participate in this exciting new initiative and all research students and staff are under its umbrella.

For more details of CRiSM and its current activities visit: www.warwick.ac.uk/go/crism

Risk Initiative and Statistical Consultancy Unit (RISCU)

The Risk Initiative and Statistical Consultancy Unit (RISCU) is one of the foci for the application of statistical methods, risk and decision analysis and probability within the Department. Primarily this takes the form of providing consultancy services across the private, public and NGO sectors. RISCU also has a role in other forms of engagement both within and outwith the University: contributing to multi-disciplinary research projects with other university departments and other organisations, supporting the application of probability, risk and statistical theory in other disciplines, executive and continued professional development, other knowledge transfer activities.

Currently RISCU is entering a period of growth which will see it expand its work in risk and decision analysis while maintaining its statistical consultancy activities. In keeping with the research excellence of the Department, RISCU's work will be cutting edge. Sometimes there are opportunities for research students to contribute to specific projects as paid consultancy assistants - this is an excellent way of gaining experience in real applications, and making contact with prospective employers.

Also projects taken on by RISCU can sometimes lead to research topics for PhD theses and MSc dissertations. Generally RISCU seeks to build relationships with clients and through these there may be opportunities for internships. RISCU is directed by Simon French.

Recent and current contracts have helped shape the planned risk and decision process for the selection of sites for geological disposal of radioactive waste particularly in relation to the presentation of data to stakeholders, identified change points in extremely large multi-dimensional time-series, and looked at match data to inform the management of a premier league football side. We are building partnerships with the International Institute of Risk and Safety Management to help analyse data and communicate risks, and with a large multinational chemical engineering company to support their statistical concerns.

Seminars, Conferences and Reading Groups

The Department runs two seminar series, one on statistics and one on probability. Other relevant seminars including some Royal Statistical Society meetings are held in the Zeeman Building. Graduate students find it is extremely useful to attend these seminars as they provide a way of broadening their experience of research topics, as well as being a valuable and informal way to meet leading researchers from other universities and research institutions.

The CRiSM Seminar meets during teaching term, when outside speakers present their latest research on some theoretical or applied statistical topics. Applied Maths and Statistics (APMAST) Seminars are run jointly with Warwick Maths Institute.

The Department is the regular venue for the Midlands Probability Theory Seminar, which meets twice a term. At each meeting two speakers discuss topics of current interest in probability or stochastic modelling. Stochastic Finance @ Warwick seminars have been running since 2011.

The Department is a participating member of the annual Gregynog Statistics Conference, a joint venture with the University of Birmingham and the colleges of the University of Wales. All staff and graduate students are invited for a weekend away during each Easter vacation at Gregynog, a fine country house in mid-Wales. This is an excellent opportunity to hear leading statisticians from the UK and overseas present and discuss their work in a relaxed atmosphere.

Along with the CRiSM seminars which meet five times per teaching term, are weekly young researchers meetings (yrm). These provide an informal forum where research students in the department discuss research, exchange ideas, and learn from, and with each other.

There are also various occasional reading groups and informal seminars given by academic visitors and colleagues from other departments throughout the year.

MASDOC

MASDOC is a new Centre for Doctoral Training (CDT), funded by a £4M grant from the EPSRC, and run jointly between the Department of Mathematics and the Department of Statistics at Warwick.

The MASDOC doctoral training programme lasts 4 years and comprises an innovative taught-course component and PhD research of the highest standard. The first cohort of ten students entered in September 2010, and the third cohort will join the University in October 2012. About ten funded studentships, providing fees and a stipend, will be available for 2013 entry.

The programme has a broad scope, but is rooted in four themes:

- Analysis
- Computation and Numerical Analysis
- Probability
- Statistics

These are not only major areas in the mathematical sciences but are also key to developing the mathematical and statistical methodology that increasingly will be required to meet significant modern challenges such as climate change and energy production. Other application areas include nano-sciences for technological and medical applications, molecular modelling of materials, and models arising in ecology, epidemiology, data mining and many more. PhD theses from MASDOC will vary greatly, including theoretical ones which specialise in one of the four themes, and applied ones which combine techniques from two or more of the four mathematical themes. Although the programme provides a broad initial training, PhD topics can be quite specialised.

Further details of MASDOC can be found on its website at:
http://www.warwick.ac.uk/go/masdoc/

Student Profile

Lorna Barclay (MSc 2008, current PhD student)

Having done the Statistics MSc at Warwick, I was very keen to do my PhD here as well. From my dissertation over the summer I had experienced how supportive staff members are in guiding research projects. The outstanding reputation of the department as an excellent research environment is another factor that drew me to Warwick. Throughout the PhD the department offers plenty of opportunities to attend various weekly seminars and reading groups. As a first year PhD student I also had the chance to go to the Academy for PhD Training in Statistics. For me the friendly atmosphere here is very encouraging. There is always someone around, whether supervisor, Post-doc or fellow PhD student to talk to and share your research experience with.

OxWaSP

An Exciting New Opportunity: Oxford-Warwick Statistics Programme (OxWaSP)

The Statistics Departments of Warwick and Oxford University have won EPSRC funding to support a joint Centre of Doctoral Training in the theory, methods and applications of Statistical Science for 21st Century data-intensive environments and large-scale models. It is targeted at students who want to commit to research in Statistics but who currently need to be trained up from scratch in high-dimensional inference and programming; skills increasingly needed in many current statistical research programmes. This is the first Centre of its type in the world and will uniquely equip its students to work in an area in growing demand both in academia and industry.

It will provide funding for training at least 10 PhD students per year over the two universities. At least 5 of these will be based at Warwick. Warwick-based students will spend a year in Oxford engaging in guided peer learning in Oxford in a series of fortnightly modules (led by faculty from both universities) in the first 6 months training. Each module will conclude with a Mini-Symposium at Warwick. In these Symposia presentations will be made by top academics working in the broad area of that module which will then be followed by a panel discussion. In the second 6 months, students will engage in two mini-projects. Equipped with the essential skills they have acquired in their first year, the cohort of Warwick students will move to Warwick to begin a full PhD study with one of 25 potential supervisors currently researching in areas linked to the main themes of the Centre. Students will continue to meet with their peers from Oxford at regular intervals and joint small group research teams and the students will meet twice a term to discuss their frontier research.

OxWaSP – the Oxford Warwick Statistics Programme is very timely. It will train a new cohort of graduates in Modern Statistics, which is facing a sea change due to the unprecedented demands from the explosive growth of measurement technology and the emergence of "big data" and "big models". The need for large-scale highly structured statistical models has been recognised for some time within areas like genomics and brain imaging technologies. However, leading industries and sciences such as engineering, manufacturing, finance and e-commerce are now also aware of the enormous potential that data-driven analysis holds.

The analysis bottleneck has moved from being able to collect and record relevant data to being able to interpret and exploit vast data collections. To effectively address such issues it is critical that future leaders in Statistics are trained to be able to design and develop statistical approaches that are scalable to massive data.

Through the four years of their training, OxWaSP students will be trained to be skilled in the manipulation and handling of massive heterogeneous data objects, able to program for distributed high performance computing and able to communicate well with data owners (before the data collections). They can subsequently use this knowledge to develop the new statistical theories, methods and algorithms that hold the greatest promise to exploit the analysis of "big Data" using massive parallel computing platforms. Academia and industry are currently both struggling to find appropriately trained statistical researchers in the key areas covered by the OxWaSP programme.

Further details of OxWaSP can be found on the website at:
http://www2.warwick.ac.uk/fac/sci/statistics/postgrad/oxwasp

Research Degrees

Doctor of Philosophy (PhD) - 3/3.5 years full-time or 7 years part-time

The Higher Degree Research

This programme covers the degree of Doctor of Philosophy (PhD). The total period of full-time study is a minimum three- year requirement for the PhD degree. The period of registration for a PhD is at most four years.

Higher degree students engage in original research in an agreed topic under a Research Supervisor. The Research Supervisor gives training in research techniques and provides guidance and instruction in the chosen research topic.

Research students are expected to attend the regular seminar series, as well as the more informal PhD seminars and reading groups.

First Year

Much of the first year of research is devoted to a directed study of the published literature on the chosen topic and to acquiring any research skills needed for the work. Research students are encouraged to fill in any important gaps in their statistical or mathematical knowledge by reading and by attending appropriate lecture courses. In particular, first-year research students in Statistics at Warwick take full advantage of the programme of intensive short courses offered by the Academy for PhD Training in Statistics (APTS), which is an EPSRC-supported collaboration between nine leading statistics research groups (at the universities of Bath, Bristol, Cambridge, Glasgow, Lancaster, Nottingham, Oxford, Southampton and Warwick). APTS provides both a systematic coverage of research-relevant areas of probability, statistics and related mathematics, and an excellent opportunity for networking with research students at other institutions. Whilst APTS is directed and managed from Warwick, some of the short courses will be located at APTS partner institutions; the EPSRC funding for APTS includes bursaries to pay for students' travel and accommodation when taking part in such courses. In addition to APTS, research students also make use of other courses available at Warwick, for example MSc, MMathStats, MMORSE and MASDOC course modules, to fill in gaps or to broaden their knowledge. Students are expected to learn any necessary computing skills.

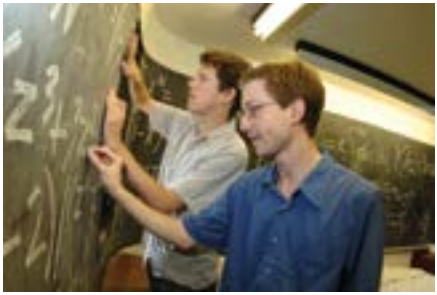
Progress is assessed via a series of oral presentations and written reports given to a panel of academic staff.

Second and Third Year

Substantial progress in original research is expected during the second year. PhD students are expected to have written at least one paper or research report (possibly jointly with the supervisor) by the end of the second year. The final months of the period of study are spent consolidating results and writing the work up as a thesis

Thesis Examination

A research thesis is normally examined by two examiners: a member of the Department and an external examiner who is expert in the particular topic, usually a senior member of staff from another university. After studying the thesis the examiners will hold an oral examination when the student will be asked questions about his/her work and about his/her wider knowledge of the subject. Award of the PhD follows a satisfactory report from the examiners. Minor revisions to a PhD thesis may be required. Exceptionally, the degree of MPhil may be awarded instead of the PhD, or the candidate may be required to resubmit the thesis with or without a further oral examination.



Taught Programmes

Master of Science (MSc) - 1 year

MSc in Statistics

The Master's programme aims to provide a postgraduate course in statistical science suitable for those with a strong quantitative background. After completing the taught portion of the Master's the student will have acquired sufficient knowledge and understanding of topics in statistical theory and practice and in probability to provide a basis for academic research or a career as a statistician, and for Master's students to put their knowledge into practice in the dissertation.

The programme aims to cover topics most relevant to a career as a professional statistician. Prior knowledge of basic statistical theory and methods is assumed, such as would be covered in a typical first degree in mathematics or a joint degree between statistics and some other discipline.

To assist students in their preparation, along with the welcome pack, a copy of an examination on statistical practice is sent to them in September. Students are expected to ensure that they are confident in the basic topics addressed.

The programme will cover a wider range of topics than would be typical of a single honours degree in statistics, and there is a much greater emphasis on practical work and the preparation of coursework reports than would normally feature at the undergraduate level. The opportunity to pursue a dissertation topic in depth can provide particularly valuable experience for the student's subsequent career. See our web-page located at: www2.warwick.ac.uk/fac/sci/statistics/postgrad/msc

For further information about the structure of the MSc programme, see the web page: www2.warwick.ac.uk/fac/sci/statistics/postgrad/msc/

MSc in Financial Mathematics

In addition to its own postgraduate degrees, the Department contributes to the Warwick MSc in Financial Mathematics. This is run jointly by the Department of Statistics, the Department of Mathematics and the Warwick Business School. Admissions are administered by the Department of Mathematics, from whom further information is available.

See their web-page located at: www.maths.warwick.ac.uk/postgrad/financial_maths/index.html

or contact:
The Postgraduate Co-ordinator,
Department of Mathematics,
University of Warwick,
Coventry CV4 7AL

Telephone: +44 (0)24 7652 4246
Email: postgrad@maths.warwick.ac.uk

Research in the Department

Staff profiles (as at Sept 2013)

Staff will be happy to receive enquiries from prospective research students in their areas of expertise. More detailed information on staff can be found at: http://go.warwick.ac.uk/statistics/staff/academic-research/

Dr Larbi Alili

Before joining the Department of Statistics at the University of Warwick as a lecturer, Larbi Alili worked as a research associate at the Suisse Federal Institute of Technology (ETH-Zürich). He previously held positions at the Université Paris VI, the University of Manchester and Vienna Technical University. He obtained his PhD in probability theory at the Laboratoire de Probabilités et Modèles aléatoires of Université Pierre et Marie Curie (Paris VI). His research interests lie in probability theory and include fluctuation theory, exit problems for Markov processes and fine properties of diffusions and Lévy processes. Recent publications include: `Boundary crossing identities for self-similar diffusions having the time inversion property', (2010) with P. Patie, and `Further results on some singular linear stochastic differential equations,' (2009) with C-T Wu.

Dr Sigurd Assing

Sigurd Assing became a Lecturer in Statistics at Warwick in 2004. He mainly works in probability theory, with particular interest in: random processes, stochastic analysis, statistical mechanics and stochastic simulation. His current research is about Central Limit Theorems for scaling limits of interacting particle systems. He gained a PhD in probability theory from the University of Jena and gained the Doctor in Science (Habilitation) at the University of Bielefeld. He previously held positions at the University of Bielefeld and Edinburgh. Recent publications include: `Invariant measures for stochastic heat equations with unbounded coefficients', (2003) with R. Manthey and `A limit theorem for quadratic fluctuations in symmetric simple exclusion' (2007).

Dr Julia Brettschneider

After earning her Diploma at University Bonn with a thesis on measure valued diffusions Julia completed a PhD at Humbold University Berlin on large deviations in models motivated by statistical mechanics. She worked as a postdoctoral fellowship at Eurandom, as a visiting assistant professor and as a research statistician at University of California at Berkeley, and as an assistant professor at Queen's University in Canada. Julia started her position as lecturer in the Warwick statistics department in September 2007.

She primarily works on pre-processing and inferential methods for high-dimensional molecular data with a special emphasis data quality assessment. This requires the application and further development of methods from exploratory data analysis, robust statistics, data validity analysis and discrete random fields. She is also involved in transdisciplinary projects involving statistical questions arising in microarray based medical and biological research, and about communication of cancer risks based on high-dimensional molecular data. Furthermore, she has been working on a project in probability theory and ergodic theory. This includes large deviations bounds in the case of phase transitions for models inspired by statistical mechanics and ergodic theorems for a certain class of skew products. Recent publications include: 'On uniform convergence in ergodic theorems for a class of skeskew product transformations', (2011), and `Quality assessment for short oligonucleotide arrays', (2008) with F Collin, BM Bolstad and TP Speed.

Dr David Croydon

David Croydon works in probability theory, with his main research interest being in diffusions on random fractals and how such processes can be constructed as scaling limits of related random walks on random graphs. He joined the Department of Statistics in 2006, after having completed his DPhil at the University of Oxford. Recent work includes: "Scaling limit for the random walk on the largest connected component of the critical random graph", "Slow movement of a random walk on the range of a random walk in the presence of an external field" and "Convergence of mixing times for sequences of random walks on finite graphs" (with B. M. Hambly and T. Kumagai).

Dr Bärbel Finkenstädt

PhD Tutor

Bärbel Finkenstädt is Reader in Statistics at Warwick, she completed her doctorate in Berlin and continued with postdoctoral work at the University of Cambridge. She is interested in the analysis of time series and its interface with dynamical systems theory in the area of molecular biology, ecology and epidemiology. She is collaborating with biologists and mathematicians at the Systems Biology Centre at Warwick. Current interests are inference about regulatory networks of genes, such as moledular clocks, and gene transcription from experimental data. The corresponding modeling approaches use stochastic differential equations, Bayesian hierarchical modeling, population dynamic models and birth and death processes. Inference techniques usually require computational simulation methods such as MCMC.

Dr Mark Fiecas

Mark Fiecas is a Harrison Early Career Assistant Professor in the Department of Statistics at the University of Warwick. He received his Ph.D. from Brown University in January 2012 and was recently a post-doctoral scholar at the University of California at San Diego. His research focuses on the theoretical and methodological developments for analyzing high-dimensional time series data, with special applications to neuroimaging data. Neuroimaging experiments often require the analysis high-dimensional time series data, and so statistical analyses of neuroimaging data must account for the curse of dimensionality in the data in order to draw valid conclusions.

Professor David Firth FBA

Head of Department

David Firth works on statistical theory, methods and computation, and applications in many disciplines, especially the social sciences. David is co-Director of the Academy for PhD Training in Statistics (APTS). Other recent activities have included chairing the Royal Statistical Society's Research Section, and membership of the National Statistics Methodology Advisory Committee. Recent publications include: *An overview of composite likelihood methods* (with C Varin and N Reid), 2011; *A generic algorithm for reducing bias in parametric estimation* (with I Kosmidis), 2010; *Exit polling in a cold climate* (with J Curtice), 2008; *Ultraviolet signals ultra-aggression in a lizard* (with M Whiting et al), 2006; *Quasi-variances* (with R de Menezes), 2004.

Professor Simon French

Director of RISCU

Simon French's research career began in Bayesian statistics and he was one of the first to apply hierarchical modelling, particularly in the domain of protein crystallography. Nowadays he is better known for his work on decision making. This began with foundational work on decision theory, exploring what is meant by rational choice. However, generally his work has become more applied, looking at ways of supporting organisations facing major strategic and risk issues. In collaboration with psychologists he has sought to support real decision makers and stakeholders in complex decisions in ways that are mindful of their human characteristics. He has worked on the design of decision support systems, again recognising the need to temper the output of models with the needs and behaviours of their users. Recently he has worked on public risk communication and engagement and the wider areas of stakeholder involvement and deliberative democracy. Simon has worked across the public and private sectors, often in contexts that relate to the environment, energy, food safety and the nuclear industry. He is also working extensively on the use of expert judgement within large and complex decision and risk analyses.

Dr Benjamin Graham

Ben Graham joined the department as an Assistant Professor September 2011. He completed his PhD at the University of Cambridge in2007 and has subsequently done postdoctoral work at the University ofBritish Columbia in Vancouver and the Ecole Normale Superieure in Paris. His research interests lie in probability theory, in particular problems relating to statistical physics. His recent work concerns the metastability phenomenon exhibited by the Ising model. Recent publications include: 'Sharp thresholds for the random-cluster and Ising models', (2011), with G Grimmett, and `Borel type bounds for the self-avoiding walk connective constant' (2010).

Professor David Hobson

David Hobson's main interests are in probability, mathematical finance and the interface between these two fields. He was awarded the 2003 Adams Prize by the University of Cambridge for his research in Mathematical Finance, and in 2005 he organised a six month programme on developments in Quantitative Finance at the Isaac Newton Institute, Cambridge. Recently

he has published extensively on the Skorokhod Embedding Problem, and his work in finance includes study of stochastic volatility models, option pricing in incomplete markets and model-independent pricing and hedging.

Professor Jane Hutton

Jane Hutton's main areas of research are survival analysis, missing data and meta-analysis. Her methodological research is strongly motivated by long-term collaborations in cerebral palsy epidemiology and treatments for epilepsy, as well as other occasional collaborations. She is also interested in modelling bounded scores measured longitudinally: such scores are widely used in clinical trials of complex interventions. The relevance of mixture models, censoring and skew distributions in this context are current topics. In addition, she has published on ethics and statistics, and has over 100 peer-reviewed publications. She has held research grants from a variety of national funding bodies, and has an international reputation as an expert witness in medico-legal cases.

Recent publications include: JL Hutton and E Stanghellini. *Modelling bounded health scores with censored skew-normal distributions* Statist.Med., 31:368 -376, (2011); M Akacha and JL Hutton. *Modelling the rate of change in a longitudinal study with missing data, adjusting for contact attempts* Statist. Med., (2011); J Anzures-Cabrera and J L Hutton. *Competing risks and left truncation in A-bomb long-term survivors.* J App. Stat., 37:821 -831, (2010).

Professor Saul Jacka

Saul Jacka is a Professor in Statistics at the University of Warwick. His research is in many areas of probability theory with special interests in mathematical finance, stochastic processes, stochastic control, optimal stopping, conditioned processes and probability on trees and related structures. Saul is currently Editor-in-Chief of the international journal Stochastics and Stochastic Reports. Some recent publications include: 'Minimising the time to a decision' and 'markov chains conditioned never to wait too long at the origin' From October 2011 Saul will be Director of the MSc in Financial Maths and will supervise 3 PhD students on optimal stopping, finance and stochastic control.

Dr Paul Jenkins

Paul Jenkins joined the University of Warwick in September 2012, after completing his postdoctoral work at the University of California, Berkeley. Previously he obtained his PhD at the University of Oxford. His interests lie in applied probability and statistical problems, particularly in relation to the analysis of large genetic datasets.

Research areas include diffusion processes and other stochastic models in population genetics, and computational inference using Monte Carlo and sequential Monte Carlo methods. Recent publications include "Padé approximants and exact two-locus sampling distributions" (2012), with Y. S. Song, and "Stopping-time resampling and population genetic inference under coalescent models" (2012).

Dr Adam Johansen

Adam Johansen joined the University of Warwick as a lecturer after completing a Ph.D. at the University of Cambridge and working as a research fellow at the University of Bristol. His research is focused upon the development and analysis of computational methodology, especially sequential and population-based Monte Carlo methods in addition to Markov Chain Monte Carlo. His interests also include various aspects of Bayesian statistics and statistical signal processing, particularly in time-series contexts. Recent publications include:- *Monte Carlo filtering of piecewise-deterministic processes.* Journal of Computational and Graphical Statistics, 20(1):119-139, 2011 with N. Whiteley and S. J. Godsill. - *Likelihood-free estimation of model evidence.* Bayesian Analysis, 6(1):49-74, 2011 with X. Didelot, R. G. Everitt, and D. J. Lawson. - *On solving integral equations using Markov Chain Monte Carlo.* Applied Mathematics and Computation, 216:2869-2880, 2010 with A. Doucet and V. B. Tadić.

Professor Wilfrid Kendall

Wilfrid Kendall's research interests lie mostly in probability theory and include random processes, stochastic geometry, stochastic calculus, computer algebra in statistics, and probability. Recent work includes investigations into an exciting development in Markov Chain Monte Carlo called `perfect simulation', the study of a frustrated optimization problem arising in traffic network design which has led to surprising connections with random line patterns, theoretical studies in probabilistic coupling, and work on statistical shape, recovery of curvilinear structure from point patterns, and a new collaboration on brain imaging. For more details of these topics investigate his web-page at: go.warwick.ac.uk/wsk. Professor Kendall has

written about 100 papers, including a monograph on stochastic geometry. Details of his most recent publications can be found at his web-page. He was Programme Chair for the Sixth World Congress of the Bernoulli Society and the IMS, in July 2004, and is incoming president of the Bernoulli Society, from August 2011.

He is a director of the EPSRC-funded Academy for PhD Training in Statistics, a collaboration of nine highly rated UK Statistics departments which provides national training modules for PhD-level statistics researchers.

Dr Joanne Kennedy

Jo Kennedy is a Senior Lecturer in Statistics at Warwick, having joined the department in 1998. She previously held positions at the University of Oxford and Bristol. She gained her PhD in probability theory at the University of Cambridge after completing her undergraduate and MSc degrees at the University of Sydney. In recent years her research activities have focused on interest rate derivatives with particular attention to the modeling requirements of market practitioners. She is co-author with Phil Hunt of Financial Derivatives in Theory and Practice, John Wiley & Sons, 2nd Edition, 2004. Recent references include 'A comparison of Markovfunctional and market models: The one-dimensional case', with Mike Bennett and 'Longstaff-Schartz, effective model dimensionality and reducible Markov-functional models' with P. Hunt.

Professor Vassili Kolokoltsov

General research interests: probability and stochastic processes, mathematical physics, differential equations and analysis, optimization and games with applications to business, biology and finances. Publications: more than 100 papers including 8 monographs (details and selected reprints on Kolokoltsov's homepage). Recent books include *Understanding Game Theory* (World Scientific, 2010), *Nonlinear Markov processes and kinetic equations* (Cambridge Tracts in Mathematics 182, Cambridge Univ. Press, 2010),*Markov Processes, Semigroups and Generators* (DeGruyter Studies in Mathematics 38,De Gruyter, 2011).

Recent papers include: The Central Limit Theorem for the Smoluchovski Coagulation Model (Prob. Theory Related Fields, 2010), *The L\'evy-Khintchine type operators with variable Lipschitz continuous coefficients generate linear or nonlinear Markov processes and semigroups* (Prob. Theory Related Fields, Online First, 2010), *Stochastic monotonicity and duality for one-dimensional Markov processes* (Mathematical Notes, 2011),*Nonlinear L\'evy and nonlinear Feller processes: an analytic introduction* (http://arxiv.org/abs/1103.5591, 2011),*Game theoretic analysis of incomplete markets: emergence of probabilities,nonlinear and fractional Black-Scholes equations*. (http://arxiv.org/abs/1105.3053, 2011).

Dr Krzysztof Latuszynski

Krzysztof Latuszynski is Assistant Professor working in the area of computational statistics, particularly design and analysis of Markov chain Monte Carlo algorithms, adaptive Markov chain Monte Carlo, simulation based inference for diffusion process and exact simulation techniques. He previously held postdoc positions at Universities of Warwick and Toronto. His recent publications include 'Adaptive Gibbs Samplers and Related MCMC Methods' with G.O. Roberts and J.S. Rosenthal, to appear in Annals of Applied Probability; 'Simulating Events of Unknown Probabilities via Reverse Time Martingales' with I. Kosmidis, O. Papaspiliopoulos and G.O. Roberts, Random Structures and Algorithms (2011).

Professor Chenlei Leng

Chenlei Leng joined Warwick as a professor of statistics in 2013. He is interested in developing statistical models for analyzing small and big datasets. In particular, his research interests span the areas of high dimesional data analysis, model selection, semi-and non-parametric statistics, logitudinal data analaysis, quantile regression, and applied statistics.

Dr Anastasia Papavasiliou

Anastasia got her PhD from Princeton University in 2002, working on stability questions for stochastic filtering and particle filters. Before coming to Warwick, she taught at Columbia University for a couple of years and spent another year in Princeton, working on efficient simulation methods for multiscale stochastic systems. She is currently working on developing statistical inference methods for continuous stochastic processes -- in particular, stochastic processes modelled as differential equations driven by rough paths. She is also interested in the problem of statistical inference for limiting multiscale models given data from the full multiscale model. Anastasia joined the Department of Statistics as a Lecturer in 2005.

Professor Gareth Roberts
Director of CRiSM

Gareth Roberts's research interests straddle Probability and Statistics, particularly Computational Statistics, Statistical Inference for Stochastic Processes, Missing Datat Statistics, Simulation of Stochastic Processes, Bayesian Inference and Infectious Disease modelling and inference. He previously held positions in Lancaster, Cambridge and Nottingham Universities having completed his PhD at Warwick. He has written over 100 papers including `Restrospective Markov chain Monte Carlo methods for Dirichlet process heirachical models', (2008), with O Papaspiliopoulos, `Latent diffusion models for survival analysis', (2010), with LM Sangalli, and `Networks and the epidemiology of infectious disease', (2011), with others.

Dr Ewart Shaw

Ewart Shaw worked for several years in a medical school before studying for a PhD and then moving to Warwick. He has research interests in Bayesian inference, survival analysis and other aspects of medical statistics, coding theory and related methods for numerical integration, and other areas of computational statistics such as MCMC, splines, and symbolic computation.

Professor Jim Smith

Jim Smith is interested in a wide range of topics in Bayesian statistics, both theoretical and applied. Current interests include graphical representatives of Bayesian models, chain events graphs, dynamic Bayesian networks, causality, formulation of statistics, Bayes classifications of biological regulatory networks and forensic inference. Recent publications include: `The Geometry of Conditional Independence Tree Models with Hidden Variables,' (2011), with P Zwiernik, `Isoseparation and Robustness in Finite Parameter Bayesian Inference', (2011), with F Rigat, and `Dynamic Staged Trees for Discrete Multivariate Time Series: Forecasting, Model Selection and Causal Analysis', (2011), with G Freeman.

Dr Dario Spano
MSc Tutor and Admissions

Dario Spano has been an assistant professor and CRiSM member at Warwick since January 2008. His research interests are in combinatorial stochastic processes and special functions with applications in Population Genetics and Bayesian Nonparametric Statistics. He has been using properties of a wide class of exchangeable random partitions and of multidimensional orthogonal polynomials to understand and construct old and new measure-valued stochastic processes.

Recent publications include: `Orthogonal polynomials kernels and canonical correlations for Dirichlet measures', (2011), with RC Griffiths, `Multivariate Jacobi and Laguerre polynomials, infinite-dimensional extensions, and their probabilistic connections with multivariate Hahn and Meixner polynomials, (2011), with RC Griffiths, and `Fragmenting random permutations', (2008), with C. Goldschmidt and J. Martin.

Dr Simon Spencer

Dr Simon Spencer is an Assistant Professor jointly appointed between Statistics and Warwick Centre for Analytical Sciences (WCAS). Simon's research interests include statistical modelling for the spread of infectious diseases, Bayesian statistics, network inference and applied probability. During his most recent project Simon developed causal inference methodology for constructing protein signalling networks from microarray data, with applications to breast cancer. He is an enthusiastic multi-disciplinary researcher, which has led to collaborations in epidemiology, microbiology and veterinary medicine.

Professor Mark Steel
PhD Admissions

Mark Steel is interested in theoretical and applied Bayesian statistics, including distribution theory, Bayesian model averaging, spatial statistics, non-and semiparametric inference, stochastic frontier models, and stochastic volatility models. Part of his interests stem from his background in economics: he held a Chair in Economics at the University of Edinburgh from 1998-2000. He then moved to a Chair of Statistics at the University of Kent at Canterbury and joined the University of Warwick in 2003. He is an Editor of Bayesian Analysis, Associate Editor of the Journal of Econometrics and the Journal of Productivity Analysis and a Fellow of the Journal of Econometrics. Previously, he was Associate Editor of the Journal of the Royal Statistical Society B and the Journal of Business and Economic Statistics. He has had a variety of roles in the International Society for Bayesian Analysis and in the Royal Statistical Society.

Recent publications include *Modelling directional dispersion through hyperspherical log-splines*, with J.T. Ferreira, Journal of the Royal Statistical

Society, B 67, (2005), 599-616; *Order-based dependent Dirichlet Processes*, with J. Griffin, Journal of the American Statistical Association, 101 (2006), 179-194; *A Constructive representation of univariate skewed distributions*, with J.T. Ferreira, Journal of the American Statistical Association, 101, (2006), 823-829; *Non-Gaussian Bayesian geostatistical modeling*, with M.B.Palacios, Journal of the American Statistical Association, 101, (2006), 604-619; *On the effect of prior assumptions in Bayesian Model Averaging with applications to growth regression*, with E. Ley, Journal of Applied Econometrics, 24, (2009), 651-674; *Model-based clustering of non-Gaussian panel data based on skew-t distributions*, with M.A. Juarez, Journal of Business and Economic Statistics, 28, (2010), 52-66; *Bayesian nonparametric modelling with the Dirichlet process regression smoother*, with J. Griffin, Statistica Sinica, 20, (2010), 1507-1527; *Stick-breaking autoregressive processes*, with J. Griffin, Journal of Econometrics, 162, (2011), 383-396; *Non-Gaussian spatiotemporal modelling through scale mixing*, with T. Fonseca, Biometrika, 98, (2011), 761-774.

Dr Elke Thönnes

Dr Thönnes is a Principial Teaching Fellow in the Department of Statistics. After obtaining her PhD in Statistics from Warwick, she worked as a post-doctoral researcher at Chalmers Technical University in Gothenburg and at Warwick before becoming a lecturer at Warwick in 2002. Her research interests span statistical image analysis, spatial statistics, stochastic geometry and computational statistics, in particular Markov chain Monte Carlo and perfect simulation. Recent applications included fluorescence images in biology, medical images (lung HRCT scans, retinal angiography) and fingerprints.

Dr Jon Warren

Jon Warren became a Lecturer in Statistics at Warwick after completing his PhD and post-doctoral work at the University of Bath. His research interests lie in probability theory and include branching processes, quantum mechanics, ergodic theory and the fine properties of Brownian motion. Recent publications include: `A multi-layer extension of the stochastic heat equation', (2011) with N O'Connell, `Some Examples of Dynamics for Gelfand Tsetlin patterns', (2009), with P Windridge, and `Dynamics for the Brownian web and the erosion flow, (2009), with C Howitt.

Dr Nikolaos Zygouras

PhD Admissions

Nikos Zygouras joined the Statistics Department of Warwick University on September 2008. Prior to this he held an Assist. Prof. (Non Tenure Track) position at the University of Southern California and a postodoc position at ETH-Zurich. He did his PhD at the Courant Institute under the supervision of S.R.S. Varadhan. His research interests include motion in random media (random polymers, random walks in random environments and random potentials) and stochastic PDEs. He is also interested in problems arising from the broader field of mathematical physics and statistical mechanics, as well from partial differential equations.

Recent publications include: `Lyapounov norms for random walks in low disorder and dimension greater than three', (2009), `Quenched and annealed critical points in polymer pinning models', (2009) with K Alexander, and `Equality of Critical Points for Polymer Depinning Transitions with Loop Exponent One', (2010), with K Alexander.

Research Staff - Research Interests

Dr Nikolaos Argyris
Multi-objective optimisation, Decision/Utility theory & analysis, Efficiency/Productivity analysis

Dr Martine Barons
Mathematical modelling and analysis of human systems, Machine learning, Complex systems, Data analysis

Dr Elisabetta Candellero
Markov chains on infinite groups, Branching processes, Random graphs, Internal aggregation models

Audrey Kueh
Wavelets, Locally adaptive yet minimax density estimation, Image reconstruction

Dr Anjali Mazumder
Probabilistic networks, Decision theory, Information theory, Bayesian methods, Value of evidence analysis

Dr Chris Oates
Graphical models and causal inference, Bayesian model selection, Statistical inference and prediction in systems biology, Markov chain Monte Carlo, Dynamical systems.

Helen Ogden
Inference in generalised linear mixed models, Composite likelihood methods

Dr Davide Pigoli
Functional data analysis, Statistical methods for non-Euclidean data, Wavelets smoothing, Spatial statistics

Murray Pollock
Monte Carlo methods, Computational methods for stochastic differential equations, Computational statistics

Dr Javier Rubio
Bayesian statistics, Modelling of kurtosis and skewness, Distribution theory

Dr Terry Soo
Probability and Ergodic theory

Funding and How to Apply

Funding ▪ Entry Requirement ▪ Fees ▪ How to Apply

Funding

UK and EU students:

Most UK research students are funded by the Engineering and Physical Sciences Research Council (EPSRC) research studentships - these pay fees plus a bursary to cover living expenses. Students from other EU countries can also be funded by the EPSRC, but on a fees-only basis. These grants are applied for through the Department and not by the student directly, and under present EPSRC arrangements the confirmation of an award can only be made after the first degree results are known in July. Studentships are awarded by the EPSRC competitively, and the success of an application cannot be guaranteed in advance. However, the Department would expect to be successful in obtaining an award for any student who has or expects to obtain a first class degree in a relevant subject. In addition, the Department is able to support research students through sponsorship by the Department itself.

Scholarships for MSc students are much less readily available, and most MSc students have been self-funded, either privately or through individual sponsorship. Two department bursaries will be available for October 2013 entry. There might be some EPSRC bursaries. The Postgraduate Prospectus 2013 provides information on the loans available for taught master's students.

Chancellor's Scholarships:

The University of Warwick also offers Chancellor's Scholarships each year for full-time study for a PhD. These awards pay for academic fees in full (at the home/EU rate) and provide a maintenance allowance at the standard rate offered by UK Research Council studentships.

Around 25 Chancellor's International Scholarships will be awarded to the very best international PhD applicants from across the University of Warwick. These scholarships pay the fees to the full Overseas rate plus a maintenance stipend. Applications are made to the Chancellor's Scholarships in a combined competition, and the 17 highest ranking applicants classed as 'Overseas' for fees purposes will be offered a Chancellor's International Scholarship.

International students:

Suitably qualified international PhD students can apply for departmental or CRiSM support. Many international graduate students come to Warwick with sponsorship from their own countries, either with government scholarships or funding through their employers. The University has a number of partial scholarships for students from specific countries, and also has access to international schemes such as the Fulbright Scholarships for graduate students from the US. The Postgraduate Prospectus 2013 gives a list of schemes available, with advice on their applications procedures, available on the web at: www.warwick.ac.uk/study/ postgraduate/funding/international (or contact the International Office on +44 (0)24 7652 3706). The availability of grants under these schemes is, however, strictly limited.

Entry Requirements

All applicants to the graduate programme should have, or expect to obtain, a bachelor's degree in mathematics or in statistics or in a subject containing a substantial mathematical component. The normal entry requirement is a good upper second class degree for Master's students and an upper second for research applicants, or equivalent grades from universities outside the UK. Exceptions can be made in particular cases, but ability in mathematics is essential for an understanding of the MSc programme or for technical aspects of PhD research. UK research applicants should note that an upper second is the minimum requirement to gain admission to the course although it does not guarantee an EPSRC award. The level of competition for EPSRC studentships is such that a first class degree is needed for a good chance of success in obtaining these awards.

There is an English language requirement for students enrolling on the graduate programme from non-English speaking countries. The minimum formal requirement is a score of 6.5 on IELTS, 92 on TOEFL, or equivalent.

Fees

Annual academic fees for 2013/2014 are as follows:

MSc in Statistics

	UK/EU	OVERSEAS
Full-time	£6,740	£15,190

PhD

	UK/EU	OVERSEAS
Full-time	£3,900	£13,420
Part-time	£2,340	£3,052

How to Apply

The Postgraduate Director in the Department of Statistics is the usual first point of contact for anyone interested in the graduate programme. Informal enquiries are welcome at any time, and the Postgraduate Tutor will be pleased to give advice on the graduate programme and entry qualifications, as well as answer any queries. Email: stats.pg.support@warwick.ac.uk

We encourage you to use our online application form because it is the quickest and most efficient method for applying for admission to postgraduate courses. The online application form can be found at: www.warwick.ac.uk/go/pgapply

If you require a printed copy of the postgraduate application form please e-mail: pgprospectus@warwick. ac.uk remembering to include your postal address or telephone +44 (0)24 7652 4585. Ensure you enclose the following information with your application form or, if you are applying online, make sure it is forwarded to the Postgraduate Admissions Team, not the Department, as soon as possible:

- 2 academic references
- Certified Degree transcripts
- English Language certificate
- Research proposal (if appropriate)

There is a non-refundable application fee of £35 for taught postgraduate courses. We will not be able to consider applications until the application fee is paid.

The decision on admission cannot be made until all the information has been supplied by the applicant. If there are difficulties in providing the necessary information (e.g. English language test yet to be taken) then indicate this on the application form.

In considering PhD applications it is necessary to check the availability of a supervisor with a specialist interest in the topic in which the student may wish to study and so research applicants are asked to indicate, at least in broad terms, the topic or topics of interest to them. The lists of staff interests and PhD topics given earlier indicate some of the research areas in which the Department is active. Research applicants in the UK who seem likely to meet the entrance requirements will often be invited to visit the Department for informal discussions with the Postgraduate Director and other members of staff, as well as to meet some of the current students. The procedure for applying for EPSRC funding can also be discussed at this stage.

Applicants wishing to be considered for one of the studentships mentioned above should indicate this in the funding section of the application form. No special application forms for these studentships are required at this stage but please also see the university website for the latest information. chancellor's Scholarships applications do require separate application forms. Applicants offered admission onto the postgraduate programme will then be notified individually by the Department of any further information needed.

The University of Warwick

Founded in the mid-60s, the University of Warwick is firmly established as one of the UK's leading universities with an excellent reputation for research, teaching and innovation. In the last Research Assessment Exercise, it was ranked fifth in the UK for research quality, and in the league tables compiled by the press, has maintained its position in the top ten UK universities. Of the 24 departments assessed for quality of teaching, 22 have been graded 'excellent'. The University has an excellent postgraduate employment record, in the last few years only 4.1% were known to be unemployed six months after graduating.

In the academic year 2011/2012 Warwick had about 23,000 students, of whom around 40% were postgraduate students; 7,000 came from overseas with more than 148 nationalities represented.

Academic life is organised in four faculties (Humanities, Science, Medicine, and Social Sciences) and around 50 interdisciplinary research centres and institutes. The University has over 5000 members of staff, of whom now 1500 are academics and researchers. Teaching and learning are supported by the excellent study facilities in the Library and departments/centres and there is a thriving culture of interdisciplinary as well as departmental conferences, seminars, workshops and reading groups, many of them student-led.

In addition, around campus there is a variety of integrated, informal and flexible learning space which will support students in individual and group based study. Warwick was one of the first UK universities to establish a Graduate School, which works with the Postgraduate Committee to monitor and enhance all aspects of graduate life at the University - academic, social and pastoral.

Warwick's 292 hectare landscaped campus is completely self-contained with its own shops, banks and restaurants. Sports facilities are excellent - swimming pool, a Sports Centre (which includes a climbing room), generous provision for outdoor sports, including a Sports Pavilion, a trimtrack with exercise stations and an all weather running track. The campus itself, with its gardens, woods and lakes, offers many opportunities for walking and recreation. Cultural life revolves around the stylish Arts Centre - the largest of its kind outside London - which includes two theatres, a concert hall, cinema, art gallery, café, giftshop and restaurant and attracts national and international performers.

There are over 1,200 rooms for postgraduates in purpose built residences on campus, which are available for 39-51 weeks of the year. Over 60% of all new postgraduates are housed on campus. Warwick Accommodation also manages over 1,600 bed spaces in the local area, and will assist students with finding suitable accommodation off campus. Purpose built flats and houses are also available on campus for postgraduate couples and families. Further information about your accommodation options and details about how to apply can be found at www.warwick.ac.uk/ accommodation. The cost of living for Warwick graduate students is considerably lower than for those at competing London institutions. Warwick's location in the heart of England makes it easy to reach from all parts of the UK and abroad. London is within 70 minutes by train and within easy reach by motorway. Stratford-upon-Avon (with the Royal Shakespeare Theatre) is a half-hour's drive, Oxford is an hour away by train or motorway, and Birmingham International Airport can be reached in 20 minutes.

Warwick Graduate School

Postgraduate education at Warwick is co-ordinated by the University's Graduate School. The School works closely with academic departments to ensure that our postgraduate courses are of the highest quality. All graduate students are members of the Graduate School and the interests of these students lie at the centre of the University's priorities. The Graduate School works in partnership with the Postgraduate Committee of the Students' Union to monitor the academic and social facilities that are available to all graduate students at Warwick. This ensures that the educational experience for postgraduates at Warwick is of a standard to be expected from one of the country's leading research universities.

Equal Opportunities

In 1986 the University Council agreed the following Equal Opportunities Policy Statement: "The University of Warwick, in conformity with the general intention of its Charter, confirms its commitment to a comprehensive policy of equal opportunities in employment in which individuals are selected and treated on a basis of their relevant merits and abilities and are given equal opportunities within the University. The aim of this policy is to ensure that no job applicant or employee should receive less favourable treatment on any grounds not relevant to good employment practice. The University is fully committed to a programme of action to make this policy effective."

Further Information

The Postgraduate Prospectus 2014 contains a wealth of information about the University and facilities for postgraduate study. Information about the Graduate School, as well as details of many other activities at Warwick, can also be accessed through the University's website: www2.warwick.ac.uk/services/ academicoffice/gsp/

Enquiries can be addressed to:
Postgraduate Admissions
Student Recruitment and Admissions Office
University of Warwick
Coventry
CV4 8UW

Tel: +44 (0)24 7652 4585
Fax: +44 (0)24 7652 4649
Email: pgadmissions@warwick.ac.uk

For enquiries about the Statistics Graduate Programme, contact:
The Director of Postgraduate Studies
Department of Statistics
University of Warwick
Coventry
CV4 7AL

Tel: +44 (0)24 7615 0886
Fax: +44 (0)24 7652 4532
Email: stats.pg.support@warwick.ac.uk

The Department's website is at:
www.warwick.ac.uk/go/stats

Applicants are welcome to visit the Department by arrangement with the Postgraduate Director. A map showing the location of the Department can be found on our website.

For the benefit of applicants, this guide is produced at the earliest date possible.

The University, however, reserves the right to modify or cancel any statement in the guide, and accepts no responsibility for any consequences of such modification or cancellation.

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WARWICK

www.warwick.ac.uk/go/statistics

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