apts.ac.uk

Academy for PhD Training in Statistics

Week 3: University of Warwick

2nd - 6th July, 2012

Welcome to Warwick!

Workshop registration: Registration on Monday will take place in the main atrium of the Maths & Statistics Building (no. 35 on the map), between 11.15 and 12.45.

You will receive your badge from the registration desk. Please wear your badge at all times. This will help with security and also help you identify fellow participants.

IT: Computing facilities are available from 09.00 - 18.00 in rooms A0.01 and A0.02 of the Maths & Statistics Building (by the main entrance). The login details will be supplied on the first day of the workshop. If you have a laptop that supports wireless networking, wireless access to basic Internet services is also available (eduroam is supported across most of the Warwick campus).

The Start.Warwick app, available for iPads, iPhones and Android devices from `http://www2.warwick.ac.uk/services/its/servicessupport/web/mobileapps/start`, provides useful information on travel and an interactive map of the campus amongst other things.

Car Parking: Workshop participants are invited to use conference car park 7 or 8a. Car parking is free of charge during your event in the conference car parks, both of which are shown on the enclosed campus map. If you park in either of these car parks, you will need a token to exit — these should be collected from Rootes reception when you check in.

Messages: The telephone number for colleagues or family to leave an urgent message for you during office hours is 02476 574812. For emergency messages outside these times, please call the main University Switchboard on 02476 523523.

Bars: The central campus has two main bars, "The Bar" situated in Rootes Social Building and the Arts Centre "Cafe Bar". Both serve a wide selection of draught and bottled beers, spirits and soft drinks. There are also bars situated within the Students' Union.

Other Campus Facilities: Facilities at the University include a pharmacy, cinema, hairdresser, newsagent, Post Office, supermarket and a launderette. In the Arts Centre, the University Bookshop is a great resource for titles of all kinds.

There are Natwest, HSBC and Barclays Banks on campus with cash dispensers. These can be found in the mall area around Rootes Social Building.

All participants have full use of the extensive and well maintained 750 acre campus, with Warwickshire walks and comprehensive sports facilities including swimming, squash and tennis. Sports facilities are available to participants free of charge. Details and opening times are available at Rootes Reception.

Accommodation information

Your room: Workshop participants with accommodation have been booked in to standard bedrooms; please collect your keys after registering from the Rootes reception desk (46 on the campus map). Bedrooms all have: clock radio, free Internet access via network point (please bring your own ethernet network cable), hair dryer, washbasin, towels and basic toiletries with en-suite bathrooms.

Reception: The Rootes Reception staff will be pleased to answer your queries between 07.00-23.00 at Rootes Social Building (49 on the campus map). You can contact Reception by internal phone from your hall of residence, extension *22280, or by direct line on 02476 522280 or 02476 523936. (NOTE: all internal numbers are free, but whenever using pay phones, always prefix the internal number with a star *).

Checking in/out: You should report to Rootes Reception, on the ground floor of Rootes Social Building (next to the main campus bus stop; No. 49 on the map) to check in to your accommodation. Rooms will be definitely be available from 3.00pm for check in; in previous years it has often been possible for delegates to check in on arrival, but please don't rely on this. Please vacate your bedroom by 9.30am on your day of departure. Please inform Rootes Reception on arrival of any difficulties you may have in the unlikely event of an evacuation (e.g. hearing or walking difficulties).

Keys: Rootes will provide one key, which gives access both to your room and the outer door of the Residence. Keys can be left at Rootes Reception upon departure or in the boxes situated in the entrance halls of each Residence.

Luggage: If you require storage for your luggage, please ask at Rootes Reception which provides a secure area for luggage storage.

Internet access: All bedrooms on campus are networked for free Internet access (for computers with an ethernet network card). Do please bring your own ethernet cable if you wish to take advantage of this. Alternatively, PCs with free Internet and email access are available for both day and residential guests in Rootes Reception. These may be accessed 07.00-23.00 Monday-Sunday. Eduroam is available in many University buildings — but at the time of writing, not in the accommodation.

Meals: The lively Rootes Restaurant in the Rootes Social Building offers excellent buffet style food every day with a cooked or continental breakfast, a hot and cold buffet selection at lunch and a two course evening meal. During the APTS week, those with accommodation are booked for breakfast on Tuesday-Friday at Rootes. All participants are booked for dinner at Rootes on Monday-Wednesday evenings. Thursday evening we will be holding an 'Academy dinner' in the Panorama Suite (above Rootes Restaurant). There is also a bar located on the first floor of Rootes Social Building, which serves draught beers, a good selection of bottled beers, wines, spirits, soft drinks and a variety of teas and coffees.

Lunches and refreshment: will be provided in the main atrium of the Maths & Statistics building. The Mathematics Undergraduate Student work area (accessible from the atrium) will be open to provide seating during these breaks.

Campus map
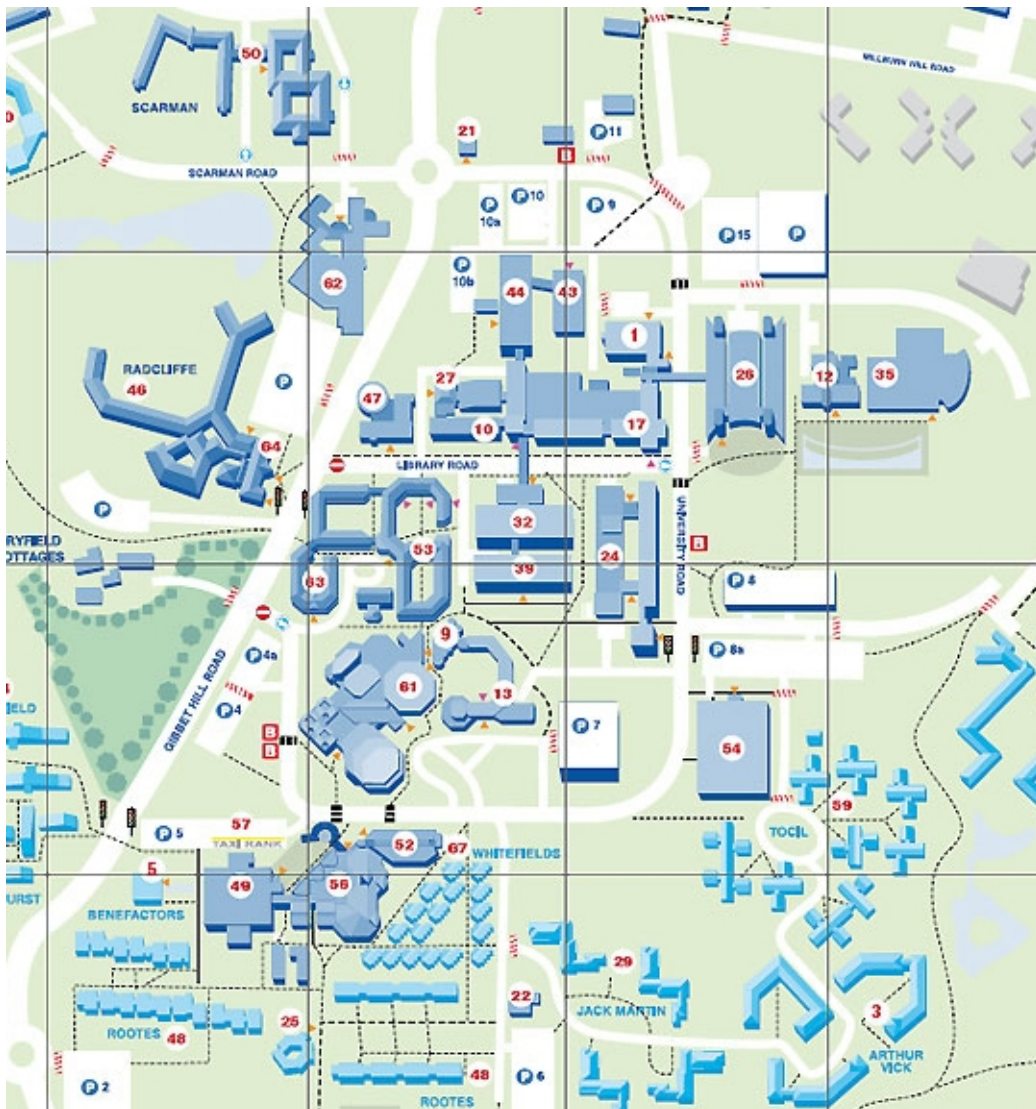
1 - Advanced Technology Centre	26 - International Manufacturing Centre	46 - Ramphal Building
3 - Arthur Vick		**48 - Rootes**
5 - Benefactors	27 - IT Services	**49 - Rootes Social Building**
9 - Chaplaincy	29 - Jack Martin	50 - Scarman
10 - Chemistry	30 - Lakeside	52 - Shops
11 - Claycroft	32 - Library	53 - Social Studies
12 - Computer Science	**35 - Mathematics and Statistics**	54 - Sports Centre
17 - Engineering	39 - Modern Records Centre and BP Archive	56 - Students' Union
21 - Gatehouse		57 - Taxi Rank
22 - Health Centre	43 - Physical Sciences	59 - Tocil
23 - Heronbank	44 - Physics	60 - University House
24 - Humanities Building	44 - Radcliffe	61 - Warwick Arts Centre
25 - International House		P - Car parks

APTS Timetable

	Monday 2nd July	Tuesday 3rd July	Wednesday 4th July	Thursday 5th July	Friday 6th July
09.30 – 11.00		**Applied Stochastic Processes**	**Applied Stochastic Processes**	**Applied Stochastic Processes**	**Applied Stochastic Processes**
11.00 – 11.30	Registration (11.15 – 12.45)	Coffee			
11.30 – 13.00		**Computer Intensive Statistics**	**Computer Intensive Statistics**	**Computer Intensive Statistics**	**Computer Intensive Statistics**
13.00 – 14.30	Lunch				
	Welcome (14.00–14.15)				
14.30 – 15.30	**Applied Stochastic Processes (14.15–15.45)**	**Applied Stochastic Processes**	**Special Lecture Prof. Cox**	**Applied Stochastic Processes**	
15.30 – 16.00	Coffee				
16.00 – 17.00	**Computer Intensive Statistics (16.15 – 17.45)**	**Computer Intensive Statistics (Computer lab)**	**Computer Intensive Statistics (Computer lab)**	**Computer Intensive Statistics (Computer lab)**	
17.00 – 17.15		**Computer Intensive Statistics (Wrap up)**	**Computer Intensive Statistics (Wrap up)**	**Computer Intensive Statistics (Wrap up)**	
18.30 – 19.30	Dinner				
Evening	RSS Wine Reception (20.00 –)	Evening Session 1 (20.00 – 20.45)	Evening Session 2 (19.30 – ?)	Academy dinner (19.30 –)	

Timetable notes

- **Locations:** All the lectures, computer labs and the first evening session will take place in the Maths & Statistics Building. Lectures, the "wrap-up" sessions and the evening session will be held in MS.01 (which is accessible from the main atrium). Computer labs will take place in rooms A0.01 and A0.02 (next to the building's main entrance).

- **RSS Reception:** The Royal Statistical Society has very generously decided to host a wine reception on the first evening and their representative, Tim Davis, would be keen to meet as many of you as possible.

- **Laboratory sessions:** You are encouraged to bring your own laptop to work on during these sessions. Detailed information about software requirements and configuration can be found at: `http://www.stats.ox.ac.uk/~ripley/APTS2012/`.

- **Special lecture:** We're very pleased to welcome Professor Sir David Cox (`http://www.stats.ox.ac.uk/people/associate_staff/david_cox`), an eminent statistician and excellent speaker, to deliver a special lecture.

- **Evenings:** The Tuesday evening session is designed to be much less intensive than the main sessions of the day, aiming to show, in a series of short vignettes, some examples of statistics in the real world. It will start at 20.00 in MS.01, <u>Statistics at Large</u> — a presentation by statisticians:

    - Prof. David Firth: "Getting it Right on Election Night."
    - Prof. Simon French: "A simple Bayesian analysis with real impact — or how to miss the most important work you did in your PhD!"
    - Prof. Jane Hutton: "How I've increased the cost of your car insurance."

    Wednesday's evening session will be still less formal and may well involve less statistics. <u>Trip to Kenilworth (and its pubs)</u> — courtesy of Warwick's continuing PhD Students. Meet at the entrance to the Rootes building at 19:30 if you wish to join them.

- **Dinner:** Participants are booked for dinner at Rootes on Monday-Wednesday evenings.

- **Academy dinner:** this will take place in the Panorama Suite, which can be found above Rootes Restaurant. Please arrive by 19.20, ready for dinner to be served at 19.30. Smart casual dress is recommended.

Module Details

Computationally Intensive Statistical Methods

Module leader: B.D. Ripley

<u>Aim</u>: This module will introduce various computationally-intensive methods and their background theory, including material on simulation-based approaches such as Markov-chain Monte Carlo (MCMC) and the bootstrap, and on strategies for handling large datasets. The different methods will be illustrated by applications.

<u>Learning outcomes</u>: After taking this module, students will have a working appreciation of MCMC, the bootstrap and other simulation-based methods and of their limitations, and have some experience of implementing them for simple examples. Students will also have gained an appreciation of the difficulties of handling very large datasets and of some approaches to overcoming them.

<u>Prerequisites</u>: Preparation for this module should include a review of:

- relevant basic material on statistical modelling (for which the earlier APTS module 'Statistical Modelling' would be advantageous);

- basic Markov chains (as for the 'Applied Stochastic Processes' module). Basic knowledge of programming in a high-level language such as R will be assumed, and R will be used for case studies and exercises.

<u>Topics</u>:

- Overview of simulation-based inference; Monte Carlo testing.

- Basic theory of bootstrap methods; practical considerations; limitations.

- Basic theory of MCMC; types of MCMC samplers; assessment of convergence/mixing; other practical considerations; case studies.

- Strategies for dealing with large datasets: use of database management systems, multipass algorithms, subsampling, distributed computing. A case study, e.g. generalized linear models.

<u>Assessment</u>: Analysis of a data set using computationally-intensive methods. This could be a data set related to the student's research project, or an example specified by the module leader.

Applied Stochastic Processes

Module leaders: S. B. Connor & C. Goldschmidt

Aims: This module will introduce students to two important notions in stochastic processes reversibility and martingales identifying the basic ideas, outlining the main results and giving a flavour of some of the important ways in which these notions are used in statistics.

Learning outcomes: A student successfully completing this module will be able to:

- describe and calculate with the notion of a reversible Markov chain, both in discrete and continuous time;

- describe the basic properties of discrete-parameter martingales and check whether the martingale property holds;

- recall and apply significant concepts from martingale theory (indicative list: optional stopping, martingale convergence);

- explain how to use Foster-Lyapunov criteria to establish recurrence and speed of convergence to equilibrium for Markov chains.

Prerequisites: Preparation for this module should include a review of the basic theory and concepts of Markov chains as examples of simple stochastic processes (transition and rate matrices, irreducibility and aperiodicity, equilibrium equations and results on convergence to equilibrium), and with the definition and basic properties of the Poisson process (as an example of a simple counting process).

Topics:

- Reversibility of Markov chains in both discrete and continuous time, computation of equilibrium distributions for such chains, application to important examples.

- Discrete time martingales, examples, application, super-martingales, sub-martingales.

- Stopping times, statements and applications of optional stopping theorem, martingale convergence theorem.

- Recurrence and rates of convergence for Markov chains, application to important examples.

- Statements and applications of Foster-Lyapunov criteria, viewed using the language of martingales.

- Statistical applications and relevance (highlighted where appropriate throughout).

Assessment: One of

- Read an appropriately chosen paper (either specified or from a specified list), and identify some of the main stochastic process models and results referred to in the paper, describe their significance and use in the paper, and relate them to the material covered in the module.

- Complete appropriate exercises that are simple developments or extensions of aspects of the results in the module (that may be related in some way to models and results arising in the paper).

Medical and emergency information

Medical Assistance: The University Health Centre is open Monday-Friday 09.00-13.00 and 14.00-17.00. Visitors in need of emergency assistance should contact Security on internal extension 22222.

Emergency Services and Fire Procedures: For help in an emergency dial 22222 from any internal telephone and your call will be directed appropriately. Visitors are asked to familiarise themselves with the University's fire procedures which are displayed in each bedroom.

On discovering a fire in other buildings:
Raise the alarm by breaking the glass in the nearest Break Glass Point.

On hearing the continuous ringing of fire bells:
Stop what you are doing.
Leave by the nearest Fire Exit.
Walk calmly, do not run.
Do not stop to collect personal belongings.
Make your way to the nearest evacuation point, standing well clear of the building.
Do not re-enter the building until told to do so by the Fire Service or University Security Staff.

Reporting Incidents: In the unlikely event of an accident or other incident occurring on University premises, please report immediately to Rootes Reception (Ext. 22280) who will then take appropriate action. Please dial 22222 from an internal phone, or 02476 522222 externally to be in direct contact with our 24 hour security staff.