apts.ac.uk

Academy for PhD Training in Statistics

WEEK 4: UNIVERSITY OF OXFORD

20–24 March 2023

Welcome to Oxford!

Workshop registration: Registration for the APTS week will take place between 11:30–13:00 on Monday 20 March 2023 in the Ground floor social area, Department of Statistics (see Figure 1). A map showing showing key locations for the week can be found on page 5 of this booklet.


Figure 1: Department of Statistic (left) and Balliol College (right).

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

Check-in / Luggage: Check-in for residential delegates is from 2.00 pm at the Lodge, Balliol College (see Figure 1) on Monday 20 March. Check-out is by 10 am on Friday 24 March. A room will be available at the Department of Statistics to store your luggage on Monday afternoon and until lunchtime on Friday.

IT: You are encouraged, if possible, to bring a laptop with R installed for taking part in the Statistical Modelling lab sessions. See notes on pages 11 for further details. There will also be a computer lab with 50 desktop computers available for the practical sessions.

Wi-fi: We strongly advise that you set up Eduroam beforehand using https://cat.eduroam.org/. Alternatively, OWL accounts (a central wireless service for both University Members and Visitors) will be available at registration but please note you will need more than one OWL account if you plan to use multiple devices simultaneously. There will also be wifi provision for residential students staying at Balliol College. Wifi is available in the bedrooms via the OWL network and you will be given your code when you check-in.

Your room: Residential participants have rooms booked at Balliol College, Broad Street, Oxford OX1 3BJ. **Unfortunately there is no parking available at the College (if you have special requirements then please contact the local organizer)** however the Pear Tree and Water Eaton Park and rides are very convenient as the buses stop near the College: http://www.oxford.gov.uk/PageRender/decTS/Park_and_Ride_occw.htm. The College is a 15 minute walk from the railway station (taxis are available outside Oxford train station) and a 10 minute walk from the bus and coach station at Gloucester Green.

All residential delegates have been booked single room accommodation at Balliol College for 4 nights from Monday 20 March until Friday 24 March. Check-in is from 2.00 pm on Monday 20 March at the Lodge. Check-out is by 10:00 am on Friday 24 March. The Porter will give you a bedroom key and a code number to open the door to your staircase. All rooms are either ensuite or have washbasins. Linen and bedding is provided and tea and coffee making facilities are in all the rooms. Breakfast will be served in the Grand Hall, Broad Street, between 8:00 am and 9:00 am. You will have the option of a full English breakfast.

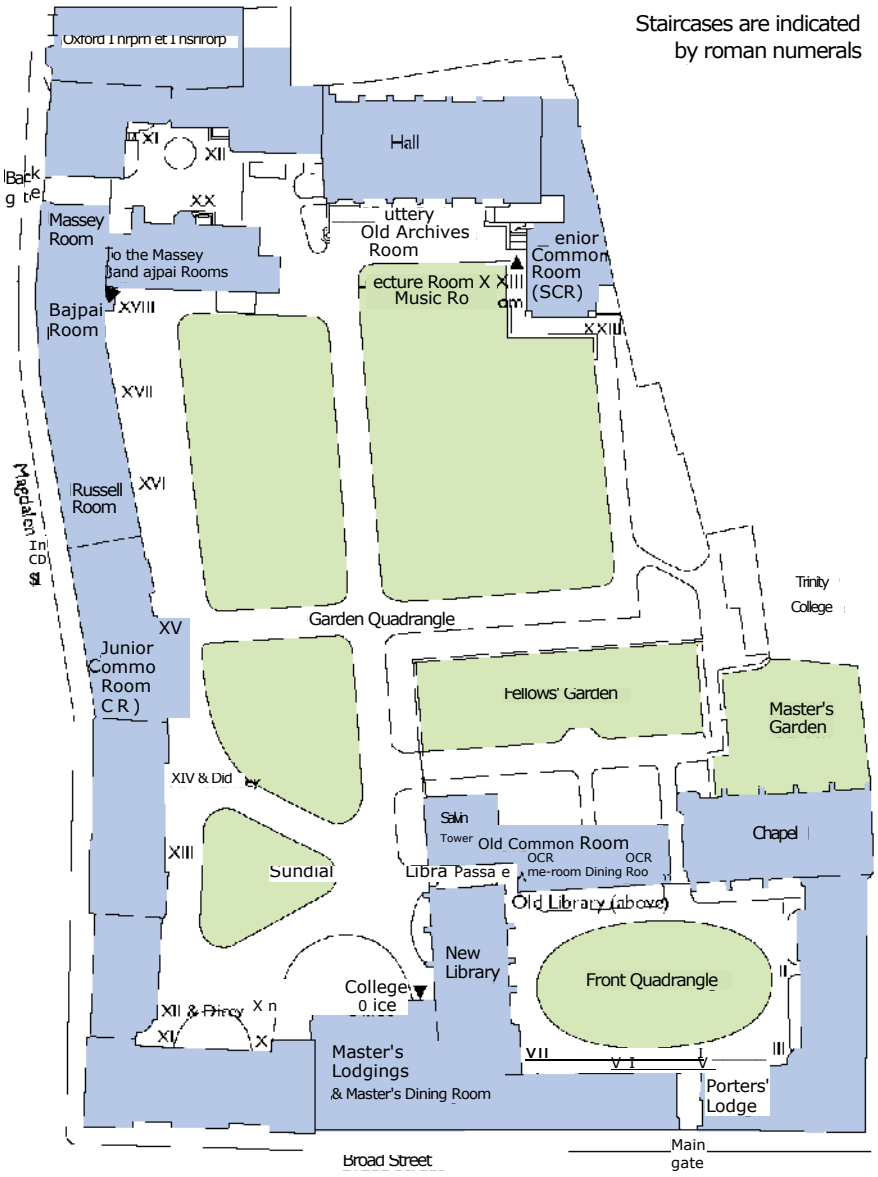
Balliol operates a non-smoking policy in all buildings and enclosed areas including outside entrances to buildings. Smoking is permitted in the Quads please use the outside receptacles provided.

Meals: All meals, with the exception of the Academy Dinner and the Social Event will take place in the main Dining Hall of Balliol College. Breakfast will be served from 08:00–09:00, lunch from 13:00–14:00 and dinner from 18:00–19:30 on Monday and Wednesday. There will be a Social Event at the Pitt Rivers Museum and Department of Statistics on Tuesday from 6.15 pm. The Academy Dinner will be held at Exeter College at 19:15 on Thursday.

Have a great week!

BALLIOL COLLEGE

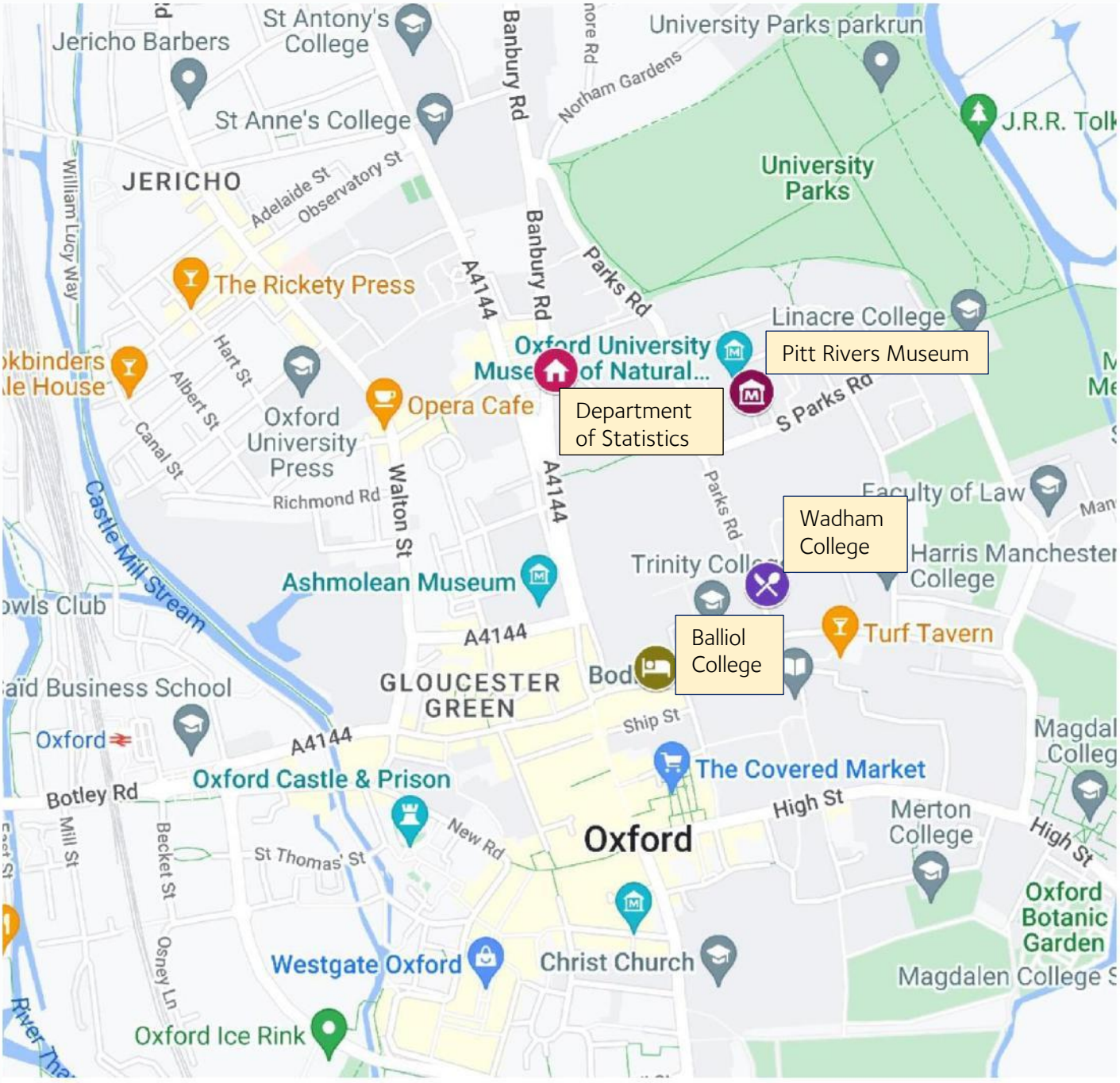
Oxford OX1 3BJ



For disabled access, please see www.balliol.ox.ac.ulddisability

For a map of Oxford, other colleges and the University buildings, please see www.ox.ac.uldvisitors/map

APTS WEEK OXFORD 2023



- Department of Statistics, 24-29 St Giles, Oxford OX1 3LB
- Pitt Rivers Museum, South Parks Road, Oxford OX1 3PP
- Wadham College, Parks Road, Oxford OX1 3PN
- Balliol College Porter's Lodge, Broad Street, Oxford OX1 3BJ

APTS Timetable

	Monday 20th March	Tuesday 21st March	Wednesday 22nd March	Thursday 23rd March	Friday 24th March
08:00 – 09:00		Breakfast			
09:30 – 11:00		Lecture ASP2	Lecture ASP4	Lecture SM4	Lecture ASP7
11:00 – 11:30		Tea & Coffee Break			
11:30 – 13:00	Registration	Lecture SM2	Lecture SM3	Lecture ASP5	Lecture AM5
13:00 – 14:00	Lunch				
14:15 – 15:45	Lecture SM1	SM (Lab 1)	Free afternoon	SM (Lab 2)	
15:45 – 16:15	Tea & Coffee Break	Tea & Coffee Break		Tea & Coffee Break	
16:15 – 17:45	Lecture ASP1	Lecture ASP3		Lecture ASP6	
17:45 – 18:30	Free Time	Social Event at Pitt Rivers Museum and Department of Statistics **18.15 to 22:00**		Free Time	
18:00 – 19:30	Dinner		Dinner		
Evening	Free Evening		Free Evening	Academy Dinner at Wadham College **19.15**	

Local information

Location of lectures: All APTS lectures will take place in the Large Lecture Theatre (LG.01) at the Department of Statistics, 24–29 St Giles', Oxford OX1 3LB. The practical sessions will take place in the Large Lecture Theatre (LG.01), IT Teaching Suite (LG.02) and Small Lecture room (LG.03) at the Department of Statistics.

Tea and coffee breaks: Refreshments will be served in the ground floor social area at the Department of Statistics.

Figure 2: Pitts Rivers Museum (left) and Wadham College (right).

Evening events: Tuesday evening will start with a private viewing of displays at the Pitt Rivers Museum followed by street food at the Department of Statistics. There will be a walking bus to the Pitt Rivers Museum leaving the Department of Statistics at 6.00 pm. The Academy Dinner will take place at Wadham College at 7.15 pm on Thursday 23 March (see Figure 2). **Dress code**: Smart casual. Wadham College, Parks Road is just a few minutes' walk from Balliol College.

Sports facilities: Oxford University Sport https://www.sport.ox.ac.uk/ offer a day pass structure for non-members for the Pulse Gym (£6 for one session) and Swim (£10 per session). They also have a number of fitness classes (£10 per class) available for non-members. Please note, prebooking is required for swimming and fitness classes. You will need to register first, using the link below:
https://oxforduniversity.leisurecloud.net/JoinAtHome/landing.aspx?AppId=JHCL.
The Sports centre is located on Iffley Road, OX4 1EQ approx. 25 minutes' walk from Balliol College.

Things to do in Oxford: Oxford is a beautiful and historic city with many local attractions. Some suggestions on activities of interest are given below:

University of Oxford Colleges: Oxford University is the oldest University in the English-speaking world. Countless famous figures and great minds have studied here and you may wish to explore some of the colleges that they were a part of. There are 38 independent colleges, many of whom open their doors to visitors at least a few hours every day. Many are free to visit, but some charge a small fee. Further details can be found at the link below: https://www.ox.ac.uk/visitors/ visiting-oxford/visiting-the-colleges.

Museums, Libraries and places of interest: Oxford has a wealth of museums such as the Ashmolean Museum and the Oxford University Museum of Natural History, places of interest such as the Sheldonian Theatre as well as many tranquil areas to get away from the hustle and bustle, such as Christ Church Meadow and University Parks. For further details please see the link below: http://www.ox.ac.uk/visitors/visiting-oxford/visiting-museums-libraries-places.

TV & Film Locations Oxford is a great favourite of the film industry and has been featured as the backdrop for many TV series and films such as Inspector Morse and Harry Potter. Further details can be found at: https://www.experienceoxfordshire.org/things-to-do/films-in-oxford-oxfordshire/

Other places of interest There are many neighbouring tourist attractions that are easily accessible from Oxford such as Blenheim Palace and Bicester Village. For further details please see: https://www.experienceoxfordshire.org/oxfordshire-daycation/

Emergency details

In Office Hours

Medical Assistance: Please speak to Reception at the Department of Statistics if you need any medical assistance.

Messages: The telephone number for colleagues or family to leave an urgent message for you during office hours is +44 (0)1865 272860 or +44 (0)1865 281536.

Fire Procedures: The fire alarm is tested weekly, usually on Thursday mornings around 9:00 am. There is no need to evacuate the building then. If the fire alarm is sounded at any other time, you must evacuate the building. If you discover a fire, set the fire alarm off using the nearest red fire call point. In the event of the fire alarm sounding, evacuate the building safely and quickly. Do not use the lift. The assembly point is outside the Department of Physics, just across Keble Road. Full details of safety procedures will be provided at registration.

Out of Office Hours

Medical Assistance: Contact the Duty Porter of Balliol College at the Lodge or telephone +44 (0)1865 277777. If no reply is received, the porter may be on a security patrol. Ring for an ambulance on 999 or 112 asking them to come to the main college entrance on Broad Street. Having made the call, go to the main entrance yourself reporting the emergency to the Porter on duty and wait for the ambulance to arrive.

Messages: The Lodge, Broad Street, is open 24 hours and the Duty Porter will be glad to assist with all your queries. The Lodge can be contacted on +44 (0)1865 277777 or porter@balliol.ox.ac.uk

Fire Procedures: Upon check-in at Balliol College, you will be given an information sheet giving details of emergency procedures.

Module details

Applied Stochastic Processes

MODULE LEADERS: N. Georgiou (Durham) & M. Roberts (Bath)

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).

Further reading: Various useful textbooks at increasing levels of mathematical sophistication:

- Haggstrom (2002) "Finite Markov chains and algorithmic applications".
- Grimmett and Stirzaker (2001) "Probability and random processes".
- Breiman (1992) "Probability".
- Norris (1998) "Markov chains".
- Ross (1996) "Stochastic processes".
- Williams (1991) "Probability with martingales".

Some useful texts that are free on the web:

- Doyle and Snell (1984) "Random walks and electric networks"
- Kelly (1979) "Reversibility and stochastic networks"
- Kindermann and Snell (1980) "Markov random fields and their applications"
- Meyn and Tweedie (1993) "Markov chains and stochastic stability"
- Aldous and Fill (2001) "Reversible Markov Chains and Random Walks on Graphs"

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).
- convergence/mixing; other practical considerations; case studies.

Assessment: Complete appropriate exercises that are simple developments or extensions of aspects of the results in the module.

Statistical Modelling

Module leader: H. Ogden (Southampton)

Aims: To introduce important aspects of statistical modelling, including model selection, various extensions to generalised linear models, and non-linear models.

Learning outcomes: After taking this module, students should be able to:

- Provide a theoretical justification for the use of various criteria for model selection, and apply these techniques in practice.
- Describe some reasons why Generalised Linear Models may fail to fit real data well, and apply techniques to diagnose such failures.
- Describe some commonly-used extensions to Generalised Linear Models, and conduct frequentist and Bayesian inference for these models.

Prerequisites: Preparation for this module should (re-)establish familiarity with linear and generalized linear models, and with likelihood and Bayesian inference. Students who are familiar with (for example) chapters 4, 8, 10 and 11 of Davison (2003) ``Statistical Models" will be very well prepared (and will already know something of the areas to be covered in the module).

Topics:

- Principles and practice of model selection;
- Extensions of the Generalised Linear Model, including models for overdispersion and mixed-effects models;
- Non-linear models.

Assessment: Exercises set by the module leader, which will include some practical data analysis and statistical modelling.

Further reading:

- Davison (2003). Statistical Models.
- Gelman and Hill (2007). Data Analysis Using Regression and Multilevel/Hierarchical Models.

Notes