

apts.ac.uk
Academy for PhD Training in Statistics

WEEK 1: UNIVERSITY OF CAMBRIDGE
9th–13th January, 2012

EPSRC

Engineering and Physical Sciences
Research Council

Welcome to Cambridge!

Workshop registration: Registration for the APTS week will take place between 11.15am and 12.45pm on Monday 9th January 2012 just inside the main entrance to the Centre for Mathematical Sciences.

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.

Luggage: You will be able to leave luggage safely in the Centre for Mathematical Sciences on Monday 9th January and on Friday 13th January.

IT: For email and internet access during lunch times and breaks, you may use the computers in the computer labs GL.04 and DL.07 which are located in the ground floor of the Centre for Mathematical Sciences (number 4 on the following map). Login and password details will be included in your information pack which you can pick up at the workshop registration. Please note that you will need different accounts in the two different computer labs.

Car Parking: Limited car parking is available at the Centre for Mathematical Sciences. The vehicle entry point is on Wilberforce Road. You will need to press the buzzer to get reception to open the barrier for you. The car park may be used for overnight parking.

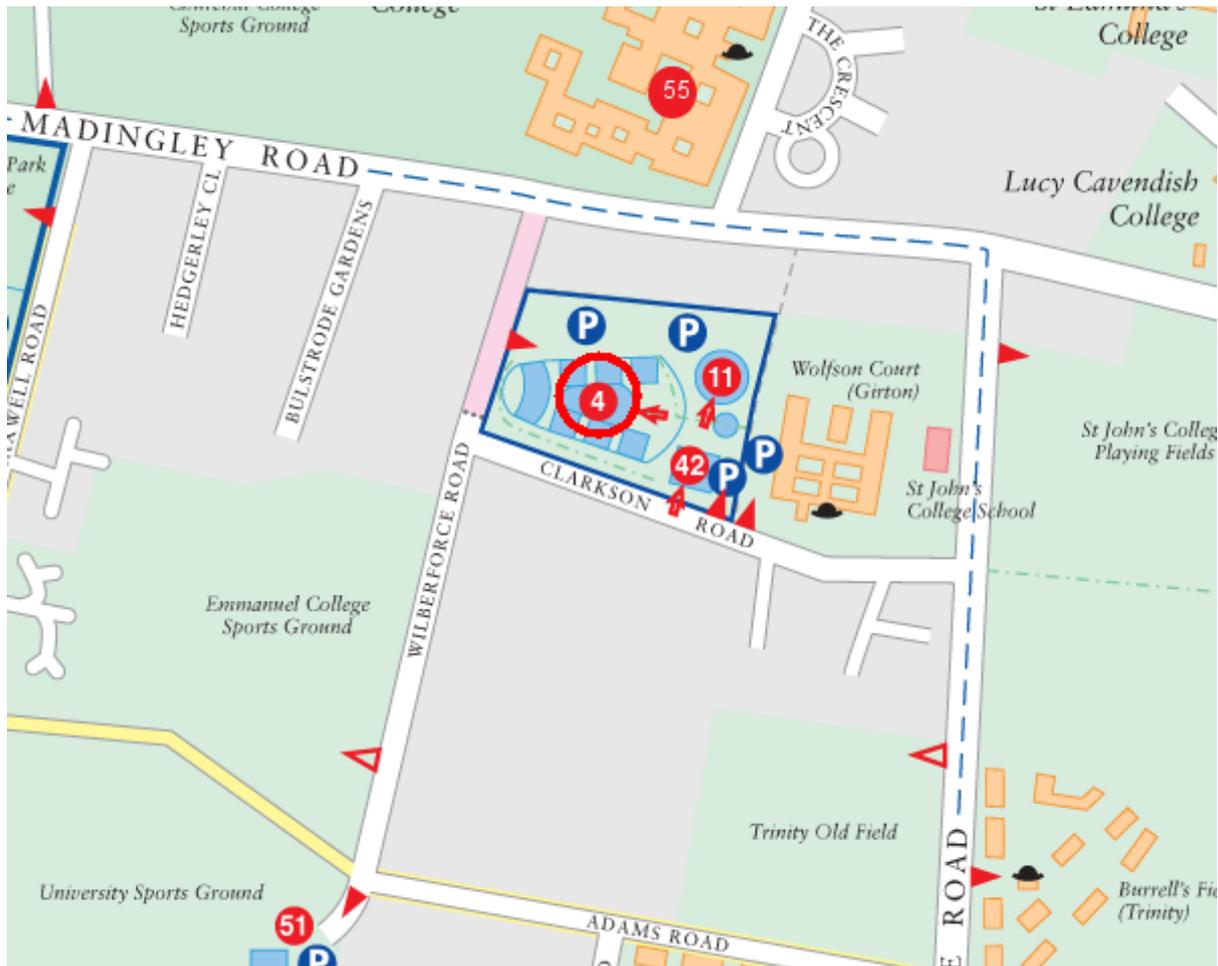
Accommodation location: Most of the APTS participants will be staying on the main Churchill College site, which is a few minutes walk away from the Centre of Mathematical Sciences (see the map).

Your room: Workshop participants with accommodation have been booked in to single rooms. Bed linen and bath towels will be provided. Bathroom facilities are shared between about six participants.

Wi-Fi is available, via the Churchill College wireless network, in all public areas. Free wired internet access is available where you will be staying. For this you can either supply your own Ethernet cable or buy one from the porters' lodge for £4. No login or password is then needed.

Checking in/out your room: On Monday 9th January, you should report to the porters' lodge at the place you are staying to check in to your accommodation. Rooms will be available after 2pm (guaranteed; it is very likely that it will be possible to check in earlier) for check in. Please vacate your room by 10am on the day of departure.

Meals: All meals (with the exception of the academy dinner) will take place in the cafeteria of Churchill College. Breakfast will be from 7.30–9.00 am, lunch from 12.45–2.30pm, and dinner from 6.00–9.00pm (although you should bear in mind the evening activities beginning at 7.30pm on Monday and Tuesday when deciding when to have dinner).



4 Department of Applied Mathematics and Theoretical Physics (DAMTP)
 Department of Pure Mathematics and Mathematical Statistics
 Cambridge Computational Biology Institute (CCBI)
 Cambridge eScience Centre
 Centre for Mathematical Sciences
 Centre for Theoretical Cosmology
 Institute for Aviation and the Environment
 Institute of Theoretical Geophysics
 Millennium Mathematics Project
 Statistical Laboratory

11 Betty and Gordon Moore Library

42 Isaac Newton Institute for Mathematical Sciences

51 Sports clubs of the University - Athletics
 Sports clubs of the University - Hockey
 Wilberforce Road Sports Ground

55 Churchill College

APTS timetable

	Monday 9th Jan	Tuesday 10th Jan	Wednesday 11th Jan	Thursday 12th Jan	Friday 13th Jan
09.15 – 10.45		Statistical Inference	Statistical Inference	Statistical Inference	Statistical Inference
10.45 – 11.15		Tea and Coffee			
11.15 – 12.45	Registration	Statistical Computing	Statistical Computing	Statistical Computing	Statistical Computing
12.45 – 13.45	Lunch				End
13.45 – 15.15	Welcome Statistical Inference	Statistical Inference	Free Afternoon	Statistical Inference	
15.15 – 15.45	Tea and Coffee			Tea and Coffee	
15.45 – 17.15	Statistical Computing	Statistical Computing (Computer Lab)		Statistical Computing (Computer Lab)	
18.00 – 21.00	Dinner				
Evening	RSS Reception (19.30 – 20.45)	Pub Quiz (19.30 –)	Free evening	Academy dinner (19.30 –)	

Local information

Location of lectures: All APTS lectures and workshops will take place in the Centre for Mathematical Sciences. The lectures will be held in room MR3 and computer labs will be in rooms GL.04 and DL.07. All of these rooms are on the lower ground floor.

Evening events: The RSS reception will take place in the central core of the Centre for Mathematical Sciences (just inside the main entrance) from 7.30pm to 8.45pm. The Pub Quiz will begin at 7.30pm in Churchill College Bar. The Academy Dinner will take place at St John's College at 7.30pm.

Sports facilities: Several sports facilities are available at the Kelsey Kerridge sports centre (see <http://www.kelseykerridge.co.uk> for details and prices). Furthermore, next door is the Parkside swimming pool (see <http://www.swimmersguide.com/query/Detail.cfm?PoolID=5531>). These facilities are about 2 miles from Wolfson Court.

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

Visiting Colleges. Most of the Colleges admit tourists, though there may be a small entrance fee. The local organiser would be happy to provide advice on particular Colleges to visit.

Fitzwilliam Museum. The Fitzwilliam Museum (<http://www.fitzmuseum.cam.ac.uk>) houses world-class collections of works of art and antiquities spanning centuries and civilisations. Highlights include masterpieces of painting from the fourteenth century to the present day, drawings and prints, sculpture, furniture, armour, pottery and glass, oriental art, illuminated manuscripts, coins and medals and antiquities from Egypt, the Ancient Near East, Greece, Rome and Cyprus.

University Botanical Gardens. Another popular site is the University Botanical Gardens, "A 40 acre oasis of beautifully landscaped gardens and glasshouses right in the heart of the city" (<http://www.botanic.cam.ac.uk>).

Kettles Yard. Kettles Yard is a modern art museum located in the city. More information can be found at <http://www.kettlesyard.co.uk>.

River Cam. If the weather is good, you might like to try punting on the river Cam (<http://www.scudamores.com>). You can either hire punts yourselves or have a chauffeured tour.

Local cafes, restaurants, pubs, etc. The local organiser will be happy to offer advice on local cafes, pubs, restaurants, cinemas and theatres.

Emergency details

Medical Assistance: Please contact a local member of staff who will alert the appropriate services.

Messages: The telephone number for colleagues or family to leave an urgent message for you during office hours is +441223 765000. For emergency messages outside these times, please call the main University Switchboard on +441223 337733.

Fire Procedures: If the fire alarm sounds for more than five seconds and there has been no warning of a prolonged test, you must leave the building by the nearest emergency exit. All exits are well signed. 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 Services or the University security staff.

Module details

Statistical Computing

MODULE LEADER: S.N. WOOD

Aim: To introduce, in a practical way, the fundamentals of numerical computation for statistics, in order to help students to write stable, fast and numerically accurate statistical programs.

Learning outcomes: After taking this module students will

- understand the importance of stability, efficiency and accuracy in numerical computations, and how these may be promoted in practical statistical computation;
- understand the main difficulties and other issues that arise in the topics given below;
- be aware of standard computational libraries and other resources.

Prerequisites: In preparation for this module, students should obtain an elementary knowledge of the use of R. (Knowledge also of a lower level language such as C, Pascal or Fortran would be an advantage but will not be presumed.) Preparation for this module should also (re-)establish familiarity with Taylor's theorem and with basic matrix algebra e.g., notion of an inverse and eigenvalues, manipulation of matrix expressions, the numerical unsuitability of Cramer's rule for computation of an inverse.

Topics:

- Finite-precision arithmetic; related types of error and stability (probably mostly covered, in context, as part of other topics).
- Numerical linear algebra (with statistical applications): basic computational efficiency, Choleski, QR, stability (e.g. Normal/Choleski vs QR for LS), eigen and singular value decompositions. Standard libraries.
- Optimization: Newton-type methods; other deterministic methods; stochastic methods; using methods effectively in practice; what to use when.
- Differentiation and integration by computer: finite differencing (interval choice, cancellation and truncation errors); automatic differentiation; quadrature methods; stochastic integration.
- Basics of stochastic simulation.
- Other types of problem (e.g. sorting and matching); the pervasiveness of efficiency and stability issues; where to find out more.

Assessment: A short project bringing together several of the topics covered. For example writing a routine to estimate a linear mixed model by (RE)ML.

Statistical Inference

MODULE LEADER: D. FIRTH

Aims: This module will provide students with a solid understanding of the main approaches to statistical inference, their strengths and limitations, their similarities and differences, and their role in underpinning statistical methodology.

Learning outcomes: After taking this module students should have an appreciation of the predominant modes of inference and their inter-relationships, and should be better equipped to read the published literature on both technical and foundational aspects of inference.

Prerequisites: Students should review the following definitions and results: likelihood, sufficiency, Bayes' theorem; simple properties of normal, exponential, binomial and Poisson distributions; linear model and the method of least squares.

Topics:

- Role of formal inference, nature of probability, frequentist and Bayesian approaches.
- Role of sufficiency; role of Neyman-Pearson theory; relation between significance tests and confidence limits.
- Maximum likelihood and associated issues; properties in 'standard' situations, and in some more difficult cases.
- Exponential-family models.
- Other approaches (e.g., estimating equations, pseudo-likelihoods).

Assessment one of:

- An essay on one of a list of topics suggested by the module leader.
- Report of a numerical investigation on one of a list of topics suggested by the module leader, e.g., comparing Bayesian and frequentist approaches to the analysis of a particular model, or assessing the accuracy of inferences based on large-sample approximation.

