

apts.ac.uk
Academy for PhD Training in Statistics

WEEK 4: LANCASTER UNIVERSITY

5th September 2011 – 9th September 2011

EPSRC

Engineering and Physical Sciences
Research Council

Welcome to Lancaster!

Travel information: A taxi from Lancaster Railway Station to the University is about £7.00. Alternatively, there is a direct bus (X1) which leaves from outside the station exit adjacent to Platform 3. The X1 bus operates Monday to Friday only between 8.15am and 5.40pm. The bus, which is operated by Stagecoach (<http://www.stagecoachbus.com>), runs regularly during these hours.

Other buses run regularly to the university from the Lancaster Bus Station (Damside Street, LA1 1PB) which is a ten minute walk from the railway station. All buses stop in the underpass underneath Alexandra Square (number 29 on the campus map).

Further travel information can be found at <http://www.lancs.ac.uk/travel/travel.htm>.

Workshop registration: Registration for the APTS week will take place between 11.15am and 12.45pm on Monday 5th September 2011 inside the Postgraduate Statistics Centre (<http://www.maths.lancs.ac.uk/psc>) of the Department of Mathematics and Statistics, Fylde College. The Postgraduate Statistics Centre is number 41a on the campus map.

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

IT: Login and password details for the computer labs will be included in your information pack which you can pick up at the APTS registration. You will also receive another set of login and password details for establishing wireless Internet access on the campus (please see <http://www.lancs.ac.uk/iss/network/winet/coveragemap.htm> for coverage information) as well as from your room.

Accommodation location, check in/out your room: Your accommodation is at Cartmel College (number 54 on the campus map) in Alexandra Park which is a 10 to 15 minutes walk from the Postgraduate Statistics Centre. Upon arrival at the Lancaster University campus, please go to the Conference Reception at the Conference Centre (number 21 on the campus map) for collection of keys, directions and, if required, car parking permits (free of charge). The main entrance to the Conference Centre is from the top of Bowland Avenue, near the Chaplaincy Centre. Check-in at the Conference Reception may be made between 08.00am and 11.00pm. For arrivals after 11.00pm you may collect your keys from Security in the Reception Lodge (number 24 on the campus map).

When you check out on Friday morning, you can either leave your key at the conference centre (luggage storage facilities are available there) or simply leave it in a tray the organisers will bring at the Lecture Theatre before the start of the Friday Lecture. Please note that any lost key will result in a charge of £50. Local Taxi numbers are (01524 848848/32090). A convenient point for taxi pick-up near the lecture theatre is the Old Sports Centre (NOT the New Sports Centre) adjacent to the Fylde College; dont forget to mention Old Sports Centre as your waiting point while booking a taxi.

Your room: Your room will be ready by 12 noon on 5th September. Please vacate your room by 10.00am on the day of departure. Please remember to return your key to the Conference Centre Reception. Luggage storage facilities will be available in the Conference Centre.

APTS Participants have been booked in single-bed, en-suite rooms. Bath towels and bed linen will be provided and there are shared kitchen facilities. Furthermore, Internet access is available in each room. For this you will need to bring your own ethernet cable. Note that this is B & B accommodation and the breakfast will be served at the adjacent Barkers House Farm between 7:30am and 9:00am from Tuesday 6th September to Friday 9th September.

Emergency details

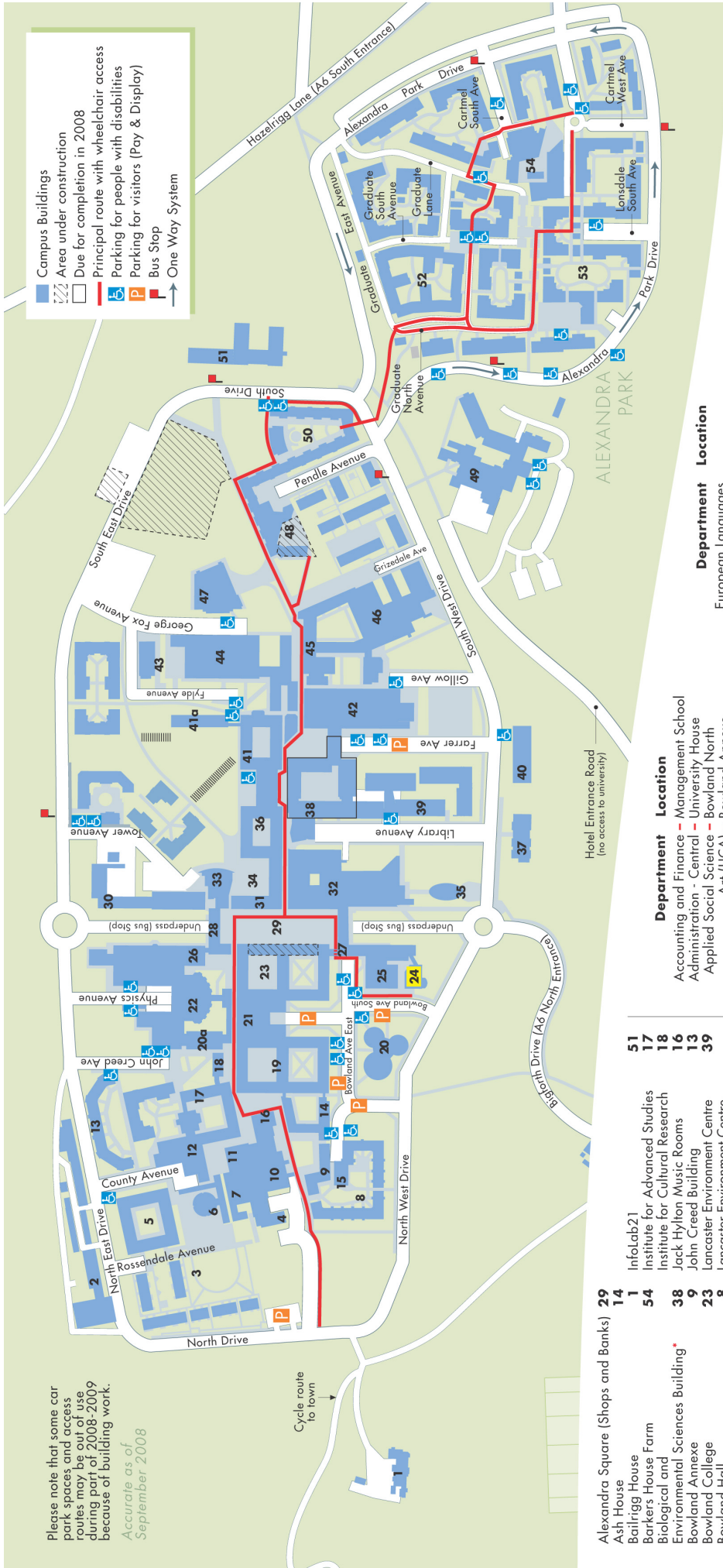
Medical Assistance: Please contact a local member of staff who will alert the appropriate services.

Messages: The telephone numbers for colleagues or family to leave an urgent message for you during the office hours is +44 1524 593964 and +44 1524 593945.

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.

Please note that some car park spaces and access routes may be out of use during part of 2008-2009 because of building work.

Accurate as of September 2008



Alexandra Square (Shops and Banks) 29

- 1 Ash House
- 54 Balfirrig House
- 1 Barkers House Farm
- 38 Biological and Environmental Sciences Building*
- 9 Bowland Annexe
- 23 Bowland College
- 8 Bowland Hall
- 19 Bowland North
- 28 Bowland Tower East
- 31 Bowland Tower South
- 54 Carmel College
- 15 Central Workshops and Stores
- 20 CETAD
- 25 Chaplaincy Centre
- 21 Computer Services (ISS)
- 5 Conference Centre
- 5 County College
- 12 County South
- 3 County West
- 34 Edward Roberts Court
- 44 Engineering Building
- 22 Faraday Building
- 36 Furness College
- 47 Fylde College
- 41 George Fox Building
- 52 Graduate College
- 10 Great Hall
- 48 Grizedale College
- 40 Health Centre
- 51 Infolab21
- 17 Institute for Advanced Studies
- 18 Institute for Cultural Research
- 16 Jack Hyllon Music Rooms
- 13 John Creed Building
- 39 Lancaster Environment Centre
- 2 Workshops
- 46 Lancaster House Hotel
- 31 Lancaster Leadership Centre
- 54 Library
- 30 Lonsdale College
- 15 LUTV - Round House
- 20 Management School
- 25 Medical Education Centre
- 21 Music Building
- 5 Nuffield Theatre
- 7 Pendle College
- 11 Peter Scott Gallery
- 34 Physics Building
- 44 Postgraduate Statistics Centre
- 22 Pre-School Centre
- 36 Reception Lodge
- 41 Ruskin Library
- 47 Slaidburn House (Students' Union)
- 35 Sports Centre
- 52 University House
- 10 University House
- 27 Whewell Building
- 43 Whewell Building

- 51 Accounting and Finance
- 17 Administration - Central
- 18 Applied Social Science
- 13 Art (LUCA)
- 39 Biological Sciences
- 2 Biomedical and Life Sciences
- 46 Careers (CEEC)
- 32 Centre for Gender and Women's Studies
- 53 Centre for Research in Human Development
- 6 CETAD
- 45 Communications Systems
- 20a Computing
- 7 Continuing Education
- 4 Counselling Service
- 11 Dentist
- 50 Disabilities Service
- 11 Economics
- 26 Educational Research
- 41a Engineering
- 37 English and Creative Writing
- 24 Environmental Science
- 35 Environmental Sciences Building
- 33 English and Environmental Sciences Building
- 42 English and Environmental Sciences Building
- 27 English and Environmental Sciences Building
- 43 English and Environmental Sciences Building

- 29 European Languages and Cultures
- 49 Geography
- 37 Graphics (Folio)
- 38 Health Research
- 39 History
- 40 Information Systems
- 41 Institute for Advanced Studies
- 42 Institute for Cultural Research
- 43 Institute for Entrepreneurship and Enterprise Development
- 44 Learning Development Centre
- 45 Linguistics and English Language
- 46 Management Development Division
- 47 Management Learning and Leadership
- 48 Management Science
- 49 Marketing
- 50 Mathematics and Statistics
- 51 Medicine
- 52 Music (LUCA)
- 53 Music Building

- 54 European Languages and Cultures
- 55 Geography
- 56 Graphics (Folio)
- 57 Health Research
- 58 History
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- 108 Medicine
- 109 Music (LUCA)
- 110 Music Building

*Some offices temporarily relocated to Furness College

APTS timetable

	Monday 5th Sep	Tuesday 6th Sep	Wednesday 7th Sep	Thursday 8th Sep	Friday 9th Sep
09.15 – 10.45		Spatial and Longitudinal Data Analysis	Spatial and Longitudinal Data Analysis	Spatial and Longitudinal Data Analysis	Spatial and Longitudinal Data Analysis
10.45 – 11.15		Tea and Coffee			
11.15 – 12.45	Registration	Nonparametric Smoothing	Nonparametric Smoothing	Nonparametric Smoothing	Nonparametric Smoothing
13.00 – 14.00	Lunch				
14.00 – 14.15	Welcome				
14.15 – 15.15	Spatial and Longitudinal Data Analysis (14.15 – 15.45)	Spatial and Longitudinal Data Analysis	Spatial and Longitudinal Data Analysis	Spatial and Longitudinal Data Analysis	
15.15 – 15.45	Tea and Coffee				
16.00 – 17.00	Nonparametric Smoothing (16.15 – 17.45)	Nonparametric Smoothing (Computer lab)	Nonparametric Smoothing (Computer lab)	Nonparametric Smoothing (Computer lab)	
18.30 – 19.30	Dinner				
Evening	Free Evening	RSS Reception (19.45 – 21.00)	Free evening	Academy dinner (19.00 –)	

Timetable and local information

Location of lectures: All APTS lectures will take place in the Management School Lecture Theatre 4 (building number 45 on the campus map). The lab sessions will take place in Labs 1 and 2 of the Postgraduate Statistics Centre and Lab A76 of the Engineering Building (number 44 on the campus map).

Tea and Coffee: Tea and coffee will be served in the Foyer (outside the Management School Lecture Theatre) in the morning, and in the Postgraduate Statistics Centre in the afternoon.

Meals: Buffet lunches (1.00pm to 2.00pm) and Dinners (6.30pm to 7.30pm of the 6th and 7th of September) will be in the Postgraduate Statistics Centre whereas the dinner on 5th of September will be in the InfoLab 21 Cafeteria (number 51 on the campus map) from 6.30pm to 7.30pm.

Evening events: The RSS reception will take place in the Postgraduate Statistics Centre from 7.45pm to 9.00pm on Tuesday 6th September. The Academy dinner will take place in Marco's Restaurant (<http://www.marcosrestaurant.com/>) on 8th September at 7.00pm. Marco's restaurant is located at the city centre at 27 North Road, Lancaster, LA1 1NS. **You will need to take a bus from the campus to Lancaster City Centre (approximate round-trip fare is £3). A taxi trip one way should cost about £8.50. Please note that no dedicated transportation has been arranged.**

Sports facilities: Several sports facilities are available at the Sports Centre for a small charge. Please see at <http://www.sportscentrelancaster.co.uk/> for more information.

Local information: Lancaster is a vibrant student-friendly city. Just ten minutes by bus from the university, it is filled with pubs, clubs, theatres, markets and shops. The university campus itself is surrounded by beautiful countryside with facilities such as supermarkets, banks and post office. You may pay a visit to the Ruskin Library and the Scott Gallery while in the campus (see <http://www.lancs.ac.uk/sbs/fresh/local.htm> for information).

Most of the city centre is pedestrianised. Threading through the city is the canal with its waterside inns where you can watch the procession of boats gliding by. Lancaster's past comes to life through its castle and museums, where you can explore the history of the city — from its grim stories of witches and murderers to its rich industrial and cultural history. A walk along St George's Quay will blow away the cobwebs — you may stop in at the Maritime Museum to explore Lancaster's maritime history. Up the hill lies Williamson Park with its Butterfly House and Ashton Memorial, the green-domed folly visible from many points in and around Lancaster. See <http://www.lancs.ac.uk/lancuni/uni.htm> for more information.

Module details

Nonparametric Smoothing

MODULE LEADER: R. SAMWORTH

Aim: In nonparametric statistics, it is not assumed that data come from a distribution belonging to a finite-dimensional class. This module will introduce students to the theory and methods associated with the idea of smoothing, which is one of the key concepts in modern nonparametric techniques of statistical analysis.

Learning outcomes: By the end of the module, students will understand the technique of kernel density estimation and its advantages over histograms. They will appreciate the central role played by the smoothing parameter, or bandwidth, and understand how this can be determined in practice. Students will also understand how both kernel- and spline-based smoothing methods can be used to estimate a nonparametric regression function.

Prerequisites: Preparation for this module should include a rapid review of basic probabilistic limit theory (including modes of convergence, laws of large numbers, ‘o’ and ‘O’ notation and the delta method), and basic understanding of asymptotic expansions to at least the level of the earlier APTS module ‘Statistical Asymptotics’.

Topics:

- Kernel and spline approaches to smoothing;
- Principles and practice of model selection;
- Random-effects/hierarchical/mixed models;
- Nonparametric regression;
- Applications, e.g., covariate measurement error, generalized additive models.
- Connections with wavelets and other nonparametric estimators.

Assessment: A set of exercises assigned by the module leader, or a data-analysis exercise involving practical use of some of the methods covered.

Spatial and Longitudinal Data Analysis

MODULE LEADER: P.J. DIGGLE

Aim: This module will introduce students to the statistical concepts and tools involved in modelling data which are correlated in time and/or space. The content will include models which are well established in statistical practice, although not usually well represented in the undergraduate curriculum, as well as examples of models which are central to current research in the area.

Learning outcomes: By the end of the module, students should have achieved:

- a clear understanding of the meaning of temporal and spatial correlation;
- a good working knowledge of standard models to describe both the systematic and the random parts of an appropriate model;
- the ability to implement and interpret these models in standard applications;
- an understanding of some of the key concepts which lie at the heart of current research in this area;
- appreciation of at least one substantial case study.

Prerequisites: Preparation for this module should establish familiarity with:

- standard models and tools for time series data, at the level of a typical undergraduate course on time series;
- standard models and tools for spatial data at its simplest level;
- inferential methods, including classical and Bayesian likelihood-based methods, to at least the level of the earlier APTS modules 'Statistical Inference' and 'Statistical Modelling'.

This module's preliminary web-lectures will cover the first two of the above pre-requisites.

Topics:

- Introduction: motivating examples; the fundamental problem analysing dependent data.
- Longitudinal data: linear Gaussian models; conditional and marginal models; why longitudinal and time series data are not the same thing.
- Continuous spatial variation: stationary Gaussian processes; variogram estimation what not to do and how to do it; likelihood-based estimation; spatial prediction.
- Discrete spatial variation: Markov random field models.
- Spatial point patterns: exploratory analysis; Cox processes and the link to continuous spatial variation; pairwise interaction processes and the link to discrete spatial variation.

- Spatio-temporal modelling: spatial time series; spatio-temporal point processes.
- Conclusion: review of available software (as preparation for mini-project); connections between spatial and longitudinal data analysis as two sides of the same coin.

Assessment: One of

- A critique, in essay form, of a specified research paper, including both modelling and application aspects;
- A mini-project involving the analysis of a data-set, selected by the student from several on offer (to allow students to focus on topics within the course which they find particularly interesting).

