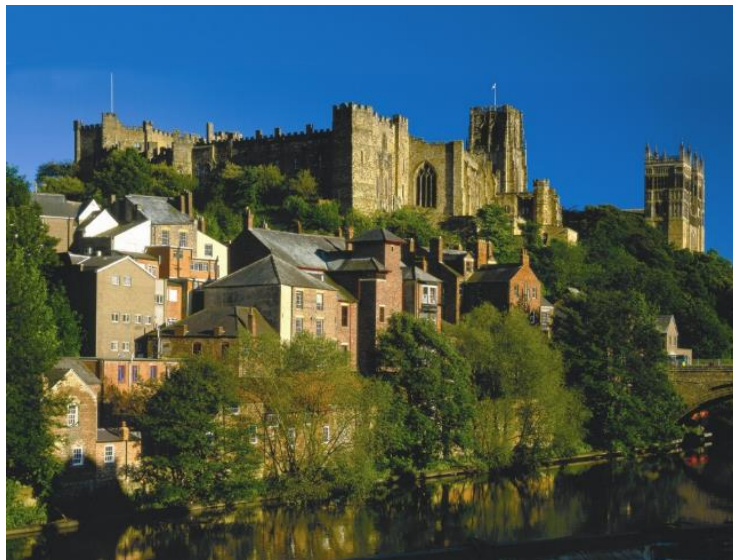


apts.ac.uk

Academy for PhD Training in Statistics



Week 3: Durham University
8 – 12 July 2024



Welcome to Durham!

CONFERENCE VENUE

The conference will take place in CG85 on the University Science site. This room is located on the ground floor of the Chemistry building, entering through the main Chemistry entrance in the Atrium-type building close to the barrier controls. It is a 10-15 minute walk from the college accommodation. Please see the Durham campus map below.

APTS REGISTRATION

Registration will take place in the Chemistry Café on Monday 8th July from 11:30am. 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. There are no facilities to store luggage on the Science Site.

Please note that most of Durham is on a slope. Let us know at registration if you have mobility difficulties, and we will try to accommodate these. There is no parking available on the University Science site.

IT

You are strongly encouraged, if possible, to bring a laptop with R installed for taking part in the practical sessions.

WI-FI

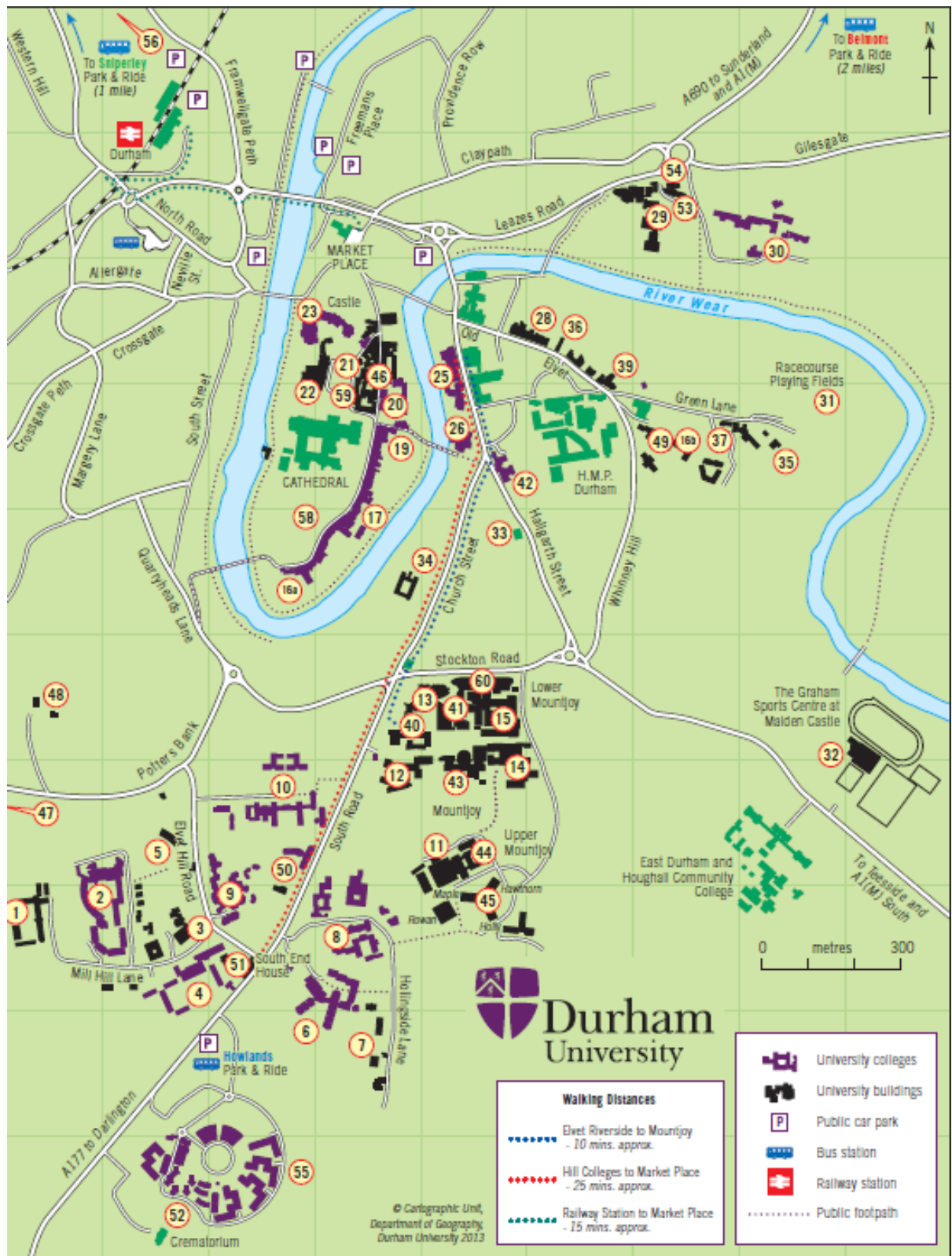
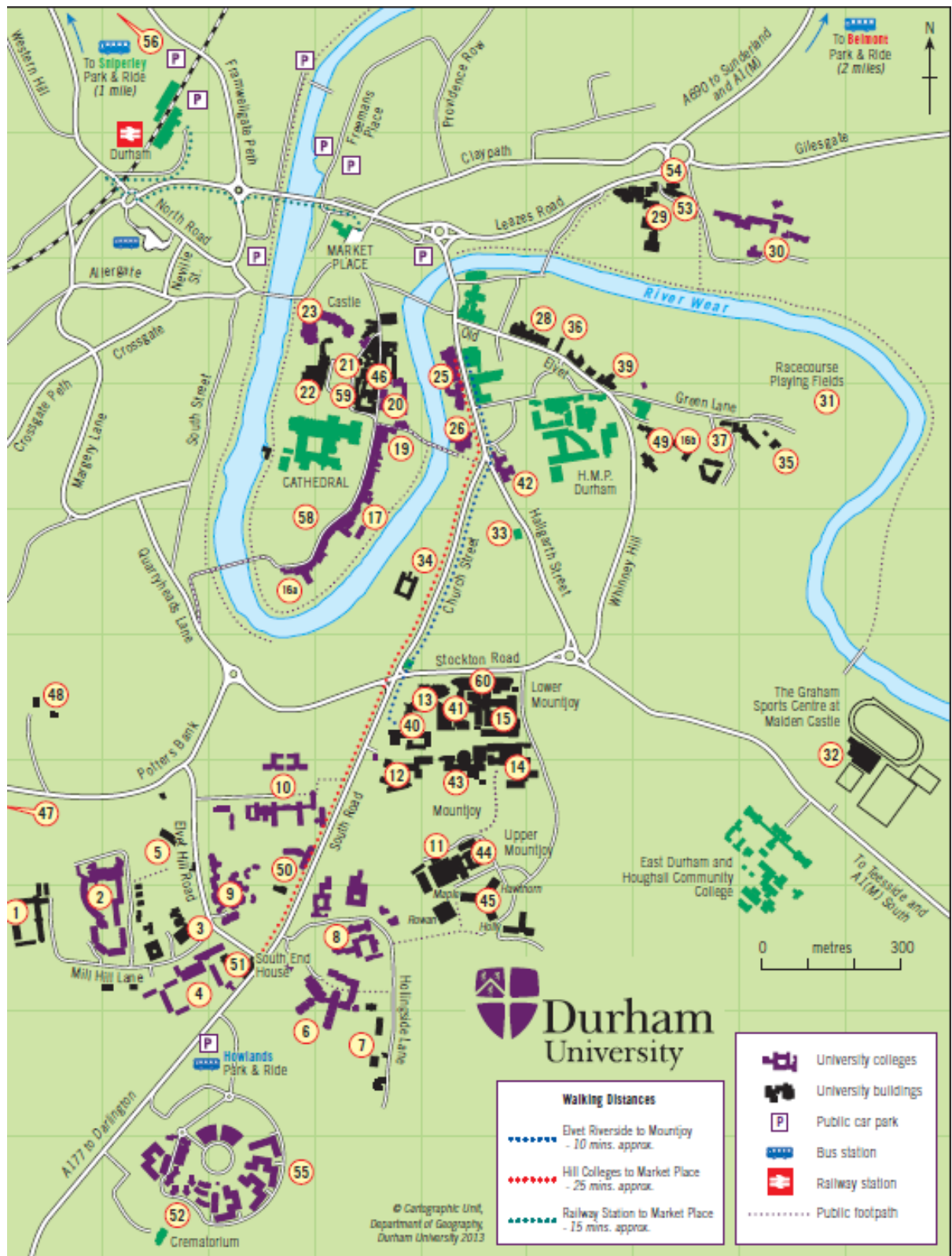
We strongly advise that you set up Eduroam beforehand via <https://cat.eduroam.org/>. Alternatively, the internet can be accessed via the cloud wi-fi; details on how to do this are available at www.durham.ac.uk/about-us/professional-services/computing-information-services/support/wireless-service/.

LECTURE THEATRES AND LABS

All lectures will take place in lecture room CG85 (Chemistry building; see item 15 on the map below). The following 'breakout' rooms are suitable for lab work and are also available at any time during the week, including breaks and free time: PCL050, PLC051, PCL053, PCL054, PCL056, PCL057, PCL058, PCL059. The breakout rooms are located in the Palatine Centre; this is a one-minute-walk from CG85 which will be signposted.

MEALS

All meals, with the exception of lunch and the Academy dinner will take place in the main Dining Hall of Grey College (item 8 on the campus map). Breakfast will be served from 7:30-8:30 and dinner from 18:30-19:30. Lunch will be from 13:00-14:00 in the Scarborough Café and Chemistry Atrium. There will be a wine reception on Monday from 19:30 in the Grey college bar. The Academy Dinner will be held at Hatfield College (item 20 on the campus map) at 19:00 on Thursday. Dress code for the Academy Dinner: Smart/casual.



Accommodation

YOUR ROOM

All residential delegates have been booked en-suite accommodation at either Grey College (item 8 on the Campus map) or Van Mildert College (item 4 on the Campus map) for 4 nights from Monday 10 July until Friday 14 July. Rooms are guaranteed to be ready by 2pm and keys can be collected from Grey College and Van Mildert College respectively. The reception will be open from 8am-4pm. Outside these times, a porter will be available to show you to your room. Please use the internal telephone near to Reception to call the porter if he is away from his post. **For all delegates, breakfast will be served in the Dining Hall of Grey College from 7:30-8:30.** You will have the option of a full English breakfast. Check out is on Friday by 10am.

Smoking is prohibited in all enclosed public places in the UK. A designated outdoor smoking area is provided at both colleges.

FACILITIES

All bedrooms have the following facilities:

- Tea and coffee making facilities refreshed daily
- Free internet connection Wi-Fi available in the bedrooms
- Bathrooms with shaver socket outlets
- Toiletry pack containing shower gel/shampoo, soap, body lotion and a vanity kit, one per person per stay
- One hand towel and one bath towel per person
- Hairdryers, irons and ironing boards available from Reception

PARKING

Car parking is limited at the college and strictly on a first come first serve basis. No spaces can be reserved. Car details will need to be registered on arrival at the College Reception.

LUGGAGE STORAGE

Grey College has limited luggage storage and will operate on a first come first serve basis. Van Mildert residents can also store luggage at Grey College.

DIRECTIONS (Public Transport)

Durham Railway station is 2 miles away. From the city bus station - a short walk from the railway station – take the Arriva No 6 Bishop Auckland service which runs every 15 minutes past the Colleges on South Road.

DIRECTIONS (Car)

Take the A690 from the A1(M), turn left across Elvet Bridge over the traffic lights. Follow the road to New Inn crossroads, go straight over. Grey College is the second turning on the left hand side. For Van Mildert College, take the second turning on the right.

Further details regarding travel information can be found below.

Emergency details

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 signposted. 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.

EMERGENCY AND MEDICAL ASSISTANCE NUMBERS

Grey College – Reception 0191 334 5900 (8am – 4pm)

Van Mildert College – Reception 0191 334 7100 (8am – 4pm)

After these hours: Porters – 07715771447 (Grey), 07717360985 (Van Mildert)

Palatine – Reception 0191 334 6111

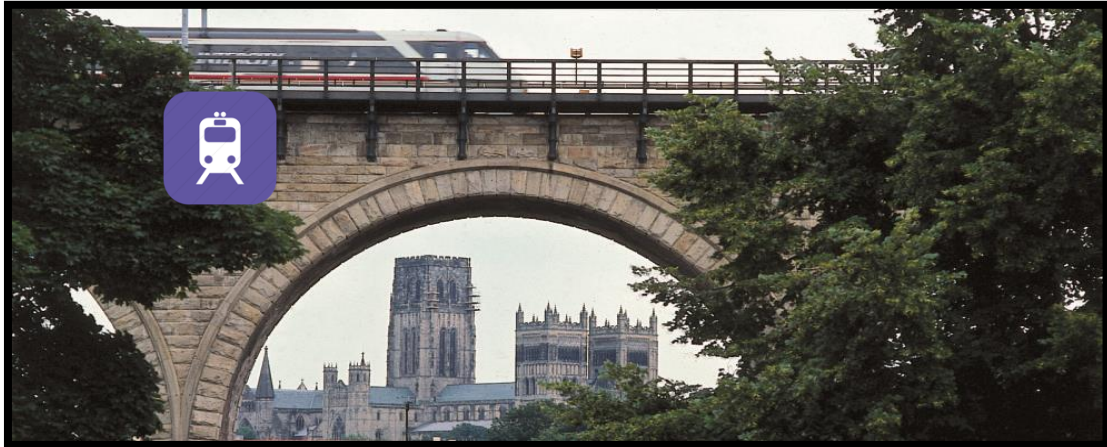
First Aiders – Please call the reception number above and they will transfer to a First Aider

Chemistry – Security – 0191 334 2222

MEDICAL ASSISTANCE

Please contact a local member of staff who will alert the appropriate services. Please note if you need to dial 999 from a mobile, please also call security on 0191 3342222 to inform them your location as the campus is complex and escorts by the security team are required for emergency service vehicles arriving onto campus to prevent any delays reaching you.

Travel Information



DURHAM STATION

Over 60 trains call at Durham daily from most major centres in the country, including 14 trains from London. The high speed LNER service takes under 3 hours from London Kings Cross on the main East Coast line. First Transpennine Express offers frequent links from North West England, Yorkshire and Scotland. Cross Country trains link Durham with Yorkshire, Manchester, Nottingham, Bristol, Cardiff, Southampton and Edinburgh.

For train times and fare information visit www.nationalrail.co.uk or call National Rail Enquiries on +44(0)3457 48 49 50.

A taxi from Durham Station to the majority of the University venues in Durham would cost in the region of £5.00 to £8.00. There is a taxi rank at the station. You will also find a list of Durham taxis in our taxi section.



NEWCASTLE AIRPORT (NCL)

Newcastle Airport is approximately 20 miles north of Durham. There are connecting flights from many European hubs including London Heathrow and London Gatwick, Amsterdam, Paris and Brussels. The airport is served by a number of budget airlines. See www.newcastleairport.com for full details.

The Metro (underground) is available from the airport to Newcastle Central Station, which takes around 20 minutes, and Metro trains run every 7 minutes. From Newcastle Central Station you can catch a train (overground) to Durham which takes around 15 minutes. If you are arriving in the evening, we recommend taking a taxi from the airport to avoid the risk of missing the last trains south. The cost would be approximately £35.00 to £60.00 depending on the taxi company (see taxi section).

DURHAM TEES VALLEY AIRPORT (DTV)

Durham Tees Valley is approximately 25 miles south of Durham. Although it has fewer flights than Newcastle, there are connecting flights with Amsterdam and other cities, and it is served by budget airlines. See www.durhamteesvalleyairport.com for full details. We would recommend a taxi from this airport to Durham.



DRIVING

Durham is only 2 miles from the A1(M) motorway. Leave the motorway at Junction 62 on the A690 heading towards Durham. Follow the signs to the city centre.

The city is served by three Park & Ride sites on the key routes into the city. These are situated at Belmont, Sniperley and Howlands. These sites are open 7am to 7pm daily. A direct bus service runs from each site to the city centre. The sites offer free parking for users of the Park & Ride service and unlimited daily travel into the city centre and back for around £2.00.

Park & Ride users can also use the bus to the Cathedral for free. Further information can be found on www.durham.gov.uk/parkandride

UNIVERSITY VENUES

Durham is a relatively small city, and most of our venues are situated not far from the city centre. More detailed information on the venues being used for your event is given on separate pages in this document.



There are many taxi companies in Durham. Please note that taxis are busy in the morning and afternoon when schools are opening/closing. If travelling at these times, we would recommend pre-booking in advance.

USEFUL TAXI NUMBERS

Airport Express +44(0)191 371 2352 (9am to 8pm)
After 8pm +44(0)793 658 5799 / +44(0)786 761 7266 Email: airport365@live.co.uk
Airport Cars Durham +44(0)191 386 5796
Mac's Taxis +44(0)191 384 1329 or +44(0)191 372 3786
Polly's Taxis +44(0)791 0179 397
Pratt's Taxis +44(0)191 386 4040 or +44(0)191 386 0700
Sherburn Taxis +44(0)191 372 3388

Local Attractions



Few venues in the world can rival the splendour, prestige and heritage of the City of Durham. Located on a dramatic peninsula overlooking the River Wear, Durham's unique Norman Cathedral and Castle not only dominate the skyline, but are also part of a designated World Heritage Site.

Durham is a small and compact city and everything is within easy walking distance. Just minutes from the bustling city centre, you can enjoy the tranquillity of leafy riverside footpaths along the banks of the River Wear, or the changing seasonal displays at Durham University Botanic Garden. Palace Green Library, the Oriental Museum and the World Heritage Site Visitor Centre hold fascinating collections of international significance, as well as offering key insights into local history.

Museums, libraries and places of interest

Durham Cathedral is only a short (10 minute) walk from Grey college and is a must see! Further details can be found at:

www.durhamcathedral.co.uk/

Why not combine a trip to the cathedral with a visit to Palace Green Library:

www.durham.ac.uk/things-to-do/venues/historic-libraries-at-palace-green/

The Botanic Gardens are very close to Grey College (and directly opposite the Mathematical Sciences building). Entry is £4.50. Further details can be found at:

www.durham.ac.uk/things-to-do/venues/botanic-garden/

The Oriental Museum is close by (turn left on to South Road and then right on to Elvet Hill Road) and has free entry:

www.durham.ac.uk/things-to-do/venues/oriental-museum/

Sports facilities

The Graham Sports Centre, Maiden Castle, is a 15 minute walk from Grey College. Facilities include a fitness centre (£5 per session www.durham.ac.uk/colleges-and-student-experience/team-durham/community/fitness-centre-and-classes/) and a

range of indoor and outdoor facilities (www.durham.ac.uk/colleges-and-student-experience/team-durham/services/facilities/).

Other attractions in Durham

For more information of what to see and do, and to make your visit unforgettable, please visit:

www.thisisdurham.com

www.dur.ac.uk/attractions

Further afield

If you wish to travel a little further afield, within a short distance of Durham visitors can experience dynamic cities, an unforgettable stretch of coastline, and a wealth of historical and natural wonders.

The world famous Beamish open air museum is approximately 9 miles from Durham and allows visitors to experience the history of the North East England. Visitors travelling by Go North East bus can save 25% on their ticket. For further details, see www.gonortheast.co.uk/beamish/ and www.beamish.org.uk/.

The sights and sounds of Newcastle are only 15 minutes north of Durham by train.

For more ideas please visit:

www.newcastlegateshead.com/explore

APTS Schedule

	Monday	Tuesday	Wednesday	Thursday	Friday
9:30-11:00		Lecture CIS3	Lecture CIS4	Lecture CIS5	Lecture HDS6
11:00-11:30		Coffee (Scarborough café / atrium)			
11:30-13:00	Registration (Chemistry atrium)	CIS Lab1*	Lecture HDS3	CIS Lab2*	Lecture HDS7
13:00-14:00	Lunch (Scarborough café / atrium)				
14:00-14:15	Welcome				
14:15-15:45	Lecture CIS1	Lecture HDS1	Free afternoon	Lecture HDS4	
15:45-16:15	Coffee (Scarborough café / atrium)			Coffee (Scarborough café / atrium)	
16:15-17:45	Lecture CIS2	Lecture HDS2		Lecture HDS5	
18:30-19:30	Dinner** (Grey College)			Pre-dinner drinks (Hatfield College)	
19:30	APTS welcome reception (Grey College)	Free evening	Free evening	Academy dinner (Hatfield College)	

***Please bring your own laptop to the computer sessions**

****Dinner on Wednesday will be served between the earlier times of 18:00-19:00**

LOCAL ORGANISERS

Georgios Karagiannis (Email: georgios.karagiannis@durham.ac.uk)

Andy Golightly (Email: andrew.golightly@durham.ac.uk)

Computer Intensive Statistics

Module leader: Richard Everitt (Warwick)

Aims: 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.

Learning outcomes: 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.

Prerequisites: Preparation for this module should include a review of:

- familiarity with basic types of convergence of random variables: in probability, almost sure and in distribution (as for example covered in Shiryaev, 1996; or Rosenthal, 2006);
- relevant basic material on statistical modelling (for which the earlier APTS module 'Statistical Modelling' would be advantageous; see also Davison, 2003);
- basic Markov chains (as for the 'Applied Stochastic Processes' module; relevant further reading can be found in Shiryaev, 1996);
- basic knowledge of programming in a high-level language such as R (R will be used for case studies and exercises). An introduction to R can be found [here](#).

Further reading on prerequisite material:

- A. C. Davison (2003). *Statistical Models*. Cambridge University Press.
- J. S. Rosenthal (2006). *A First Look at Rigorous Probability Theory*, 2nd edition. World Scientific Publishing Co.
- A. N. Shiryaev (1996). *Probability*. Springer-Verlag, New York.

Topics:

- 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.

Assessment: Exercises set by the module leader, which will include some practical simulation.

High-dimensional Statistics

Module leader: Po-Ling Loh (Cambridge)

Aims: Remarkable developments in computing power and other technology now allow datasets of immense size and complexity to be collected routinely. One common feature of many of these modern datasets is that the number of variables measured can be very large, and even exceed the number of observations. In these challenging high-dimensional settings, classical statistical methods often perform very poorly or do not work at all. In this course we will look at some of the current methods for handling such data and try to understand when and why they work well.

Learning outcomes: After taking this module, students should be able to use analogues of many of the tools from classical statistics to analyse high-dimensional datasets. They should also be more well-placed to study and make a contribution to the growing literature on high-dimensional statistics.

Prerequisites: Preparation for this module should establish:-

- Standard matrix algebra (not beyond that covered in the Statistical Computing module);
- Basic knowledge of real analysis and norms;
- Undergraduate level probability (no measure theory required) and statistics (e.g. maximum likelihood, the normal linear model, hypothesis tests and p-values);
- Thorough understanding of the normal linear model;
- Some basic elements of optimisation and convex analysis that will be covered in the preliminary material.

Further reading:

- Hastie et al, (2001). The Elements of Statistical Learning, Springer - You may wish to look at chapters 3 and 17 up to the end of 17.3.2. It is slightly less mathematical than this course but great for gaining some intuition.
- Buhlmann and van de Geer (2011). Statistics for High-dimensional Data, Springer - gives a more in-depth treatment of parts of our course. You may wish to look initially at chapter 2. Chapters 6, 10, 11 and 13 cover the material of the course, but are much more advanced.

Topics:

- Ridge regression, the Lasso and extensions;
- Graphical modelling incl. neighbourhood selection and the graphical Lasso;
- Multiple testing including the false discovery rate and the Benjamini-Hochberg procedure.

Assessment: Exercises with both a theoretical and a computational component.
