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Academy for PhD Training in Statistics

Week 3: University of St Andrews
20 – 24 July 2024

Accommodation
Conferences
and Events

University of St Andrews | FOUNDED 1413

Welcome to the University of St Andrews!

CONFERENCE VENUE

The conference will take place in the School of Physics and Astronomy, North Haugh campus, St Andrews. Please see the St Andrews map below.

APTS REGISTRATION

Registration will take place in the foyer of the School of Physics and Astronomy, as you enter through the main entrance, on Monday 20th 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 in the building.

IT

You are strongly encouraged to bring a laptop with R installed. You will need this for taking part in the practical sessions.

WI-FI

Wifi can be accessed by delegates via two methods:

Eduroam

The University of St Andrews has eduroam - a global service that enables students, researchers and staff from participating institutions to obtain wifi connectivity. This is available in most University of St Andrews buildings (including residences). If your home institution has eduroam available, **please ensure this is set-up prior to your visit to St Andrews**. You will be **unable** to set up an eduroam connection in St Andrews if you haven't already set it up where you work or study.
Eduroam can be setup before you arrive onsite:
https://www.st-andrews.ac.uk/it-support/services/wifi/connect-to-eduroam/

BT Openzone

This network is also available to guests without wifi. You will be able to connect free of charge in most University of St Andrews buildings (including residences).

LECTURE THEATRES AND LABS

All the classes will be in Physics Lecture Theatre B, which is located on the ground floor, and you can find by walking straight ahead as you enter through the main entrance. The following 'breakout' rooms will be available at any time during the week, including breaks and free time: Physics room 233, and 301 (see maps).

MEALS

For guests who will be staying in Agnes Blackadder Hall, breakfast will be available on each morning in the dining hall.

Lunch and refreshment breaks will be served in the Physics Building on each day of the conference.

We will be hosting a social evening with BBQ food on Monday 20th July in the foyer of the Medical Sciences Building.

For guests who will be staying in Agnes Blackadder Hall, dinner will be available in the dining hall on Tuesday 21st and Wednesday 22nd July.

On the evening of Thursday 23rd July, a networking drinks reception followed by a gala dinner will be held in Lower and Upper College Halls within St Salvator's Quad.

Please refer to your conference programme for timings of each meal service and refreshment break.

LOCAL ORGANISERS

Giorgos Minas (Email: gm256@st-andrews.ac.uk)

University of St Andrews

Accommodation, Conferences & Events

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Produced by Print & Design, University of St Andrews

A selection of useful maps of St Andrews can be found on the University's maps webpage, and an interactive map can be found here.

Accommodation

YOUR ROOM
All residential delegates have been booked en-suite accommodation at Agnes Blackadder Hall (see Campus map) for 4 nights from Monday 20 July until Friday 24 July. Rooms are guaranteed to be ready by 3pm and keys can be collected from the Reception. The reception will be open from 8:00. 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 Agnes Blackadder Dining Hall from 7:30-9:30. 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:

- double bed (4ft 6in wide)
- twin rooms two beds (4ft wide)
- family rooms two beds (4ft 6in wide)
- en suite shower room and toiletries
- towels and bed linen
- desk and study chair
- television
- Wifi via BT Wifi and Eduroam
- tea and coffee-making facilities

The following items are available to request from reception:

- iron and ironing board
- hairdryer
- travel cots (please enquire at the time of booking, bed linen is not provided for cots)

PARKING
Free car parking spaces are available at Agnes Blackadder Hall. Information regarding the accessibility of Agnes Blackadder Hall is available on Accessibility Guides.

LUGGAGE STORAGE
Agnes Blackadder Hall has limited luggage storage which is available for residential guests only.

DIRECTIONS

Most attendees arriving by train will transfer at Leuchars station to the frequent Stagecoach 99 bus service, a direct 15-minute journey terminating at the St Andrews Bus Station in the town center. From the bus station, the School of Physics and Astronomy is an easy, 10-minute walk. Detailed travel information for regional buses, driving, parking, and airport transfers 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

Agnes Blackadder Hall Reception – 01334 467000
Physics Building Porters – 01334 464333 selecting option 2
Security and Response – 01334 468999

Travel Information

TRAVELLING by Train

The nearest railway station to St Andrews is Leuchars, around six miles from the town. The station facilities include 24-hour parking, a waiting room and taxi rank.

Those travelling to St Andrews by train should take the Edinburgh to Dundee or Edinburgh to Aberdeen line to Leuchars. For those travelling from south of Edinburgh, the Edinburgh to Aberdeen line links up with the London North Eastern Railway (LNER) line from London to Edinburgh, which allows travel from London to Leuchars on a direct route. The LNER line also calls at stops including York, Darlington, Newcastle, and Berwick-upon-Tweed.

Alternatively, the Edinburgh Gateway station links Edinburgh Airport to Leuchars on the rail network. Those flying into Edinburgh may travel to the Edinburgh Gateway station and join a train for Leuchars.

The Caledonian Sleeper service is also an option, which runs between London Euston and Leuchars overnight.

From Leuchars, St Andrews is easily reached by bus, taxi or car.

TRAVELLING by Bus

St Andrews is easily accessible from across Scotland by bus. Most bus services arrive and depart from the bus station in the centre of town.

Bus travel within St Andrews

There are a number of bus services that serve St Andrews and the local area. Stagecoach in Fife offer a number of routes around the town through the 99 services, as well as routes that go through nearby towns and villages.

Travelling to and from Leuchars

The Stagecoach in Fife 99 service runs from St Andrews to Dundee through Leuchars approximately every 15 minutes during the day. The bus journey from St Andrews to Leuchars takes around 15 minutes. You may also choose to take the Moffat and Williamson 92 service from St Andrews to Dundee, although this service does not stop at the bus station.

Travelling within Scotland

If you are looking to travel to or from Edinburgh look out for the X58, X59 and X60 Stagecoach services, which take around two hours. Stagecoach also offers bus services to Glasgow, on the X24, X26 and X27 services, which take around two and a half hours.

Edinburgh Airport

The Stagecoach 787 bus service runs between St Andrews and Edinburgh Airport.

Travelling within the UK and Europe

For bus travel to other destinations within the UK or Europe, you may wish to investigate the Megabus or National Express services. Both leave from a number of locations, including the Seagate bus station in Dundee, and services depart for destinations including London, Newcastle, Paris and Amsterdam.

TRAVELLING by car

Driving to St Andrews is relatively simple. The town is signposted from Edinburgh and within Fife. Driving from Edinburgh takes approximately 1 hour and 20 minutes. Driving from Glasgow takes around 1 hour and 45 minutes. Driving from Dundee takes around half an hour.

Car hire

Most major airports in the UK have car hire services available within the arrivals lounge. There are also nearby car hire companies in Dundee and Cupar.

Taxis

St Andrews is home to a number of taxi and shuttle firms. They can offer a range of services, from airport transfers to collection from Leuchars station. You can find taxi ranks in St Andrews on Bell Street, on South Street, and at the bus station.

USEFUL TAXI NUMBERS

St Andrews Taxis – 01334 600600
Golf City Taxis – 01334 477788
HM Taxis St Andrews – 01334 474700
RH Taxis St Andrews – 01334 788123

Parking

St Andrews is a small town and a car is not always necessary to get around. If you decide to drive around St Andrews, please be aware that parking is limited and that it can be difficult to find a space at certain times of year. Much of the on-street parking in the centre of town is metered, and coins are required to pay.

There are a number of options for free parking in St Andrews, including the car park close to the Petheram Bridge roundabout, and car parks along the East and West Sands beaches. Some streets in the centre of St Andrews also have free spaces, although these are usually quickly filled.

Information about the location of Blue Badge spaces can be found on Fife Council's disabled parking map using the postcode KY16 9AJ.

Local Attractions

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St Andrews is a historic coastal town in the Kingdom of Fife on the east coast of Scotland. It is widely known as the “Home of Golf” and for the University of St Andrews, founded in 1413 and the oldest university in Scotland. The town includes a number of historic sites, beaches and coastal walks within a compact area.

St Andrews is small and most locations are within walking distance. Visitors can explore the town centre, harbour and pier, walk along West Sands beach and the Fife Coastal Path, or visit the cafés, restaurants and shops located throughout the town.

Museums, Libraries and Places of Interest

St Andrews Cathedral is one of the town’s principal historic landmarks and is a short walk from the town centre. The cathedral ruins were once the largest church in Scotland and remain an important medieval site. Further details can be found here. St Rule’s Tower, located beside the cathedral ruins, provides views across the town and coastline.

St Andrews Castle is also nearby and overlooks the North Sea from the cliffs to the east of the town. Visitors can explore the castle grounds, underground siege mine and exhibition spaces. Further details can be found here.

The Wardlaw Museum, located close to the town centre, includes collections from the University of St Andrews relating to local history, art and science. Entry is free. Further details can be found here.

The town's harbour and pier are located to the east of the town centre and provide views across St Andrews Bay and the North Sea. The nearby beaches, including East Sands and West Sands, are within walking distance of the town centre and are connected by sections of the Fife Coastal Path. West Sands is particularly well known for its long stretch of beach extending north-west from the Old Course.

The St Andrews Botanic Garden is situated to the south of the town centre and contains a variety of plants, woodland walks and glasshouses. Further details can be found at: https://standrewsbotanic.org/

Sports Facilities

As the "Home of Golf", St Andrews includes several well-known golf courses, including the Old Course. Information about golf in St Andrews can be found at: https://standrews.com/

Visitors interested in trying golf in a beginner-friendly setting may also wish to visit the historic St Andrews Ladies' Putting Club, located beside the Old Course. Founded in 1867, it is home to the "Himalayas" putting green, an informal putting course suitable for both experienced golfers and beginners. Equipment can be hired on site. Further details can be found here.

The University Sports Centre at Saints Sport offers a fitness centre, swimming pool and a range of indoor sports facilities. Further details can be found at: https://www.st-andrews.ac.uk/sport/

More information

More information on what to do in St Andrews can be found here.

Further Afield

Visitors wishing to travel beyond St Andrews can explore other parts of Fife and eastern Scotland, including fishing villages, coastal areas and nearby cities.

The fishing villages of the East Neuk of Fife, including Anstruther, Crail and Pittenweem, are within easy reach of St Andrews and are known for their harbours and coastal scenery. The region also includes several whisky distilleries and gin producers offering tours and tastings. Nearby options include Kingsbarns Distillery, located south of St Andrews, Eden Mill Distillery in Guardbridge, and Lindores Abbey Distillery near Newburgh.

Further details can be found at:
https://kingsbarnsdistillery.com/
https://www.edenmill.com/
https://lindoresabbeydistillery.com/

The city of Edinburgh is approximately one and a half hours away by public transport and includes a range of historical attractions, museums and cultural venues. More information can be found at:
https://edinburgh.org/

The city of Dundee is a short bus journey from St Andrews and is home to the V&A Dundee museum and the RRS Discovery. Further details can be found at:
https://www.visitdundee.com/

APTS Schedule

	Monday	Tuesday	Wednesday	Thursday	Friday
9:30-11:00		Lecture ASP3	Lecture ASP5	Lecture ASP6	Lecture CIS5
11:00-11:30		Coffee (Physics Foyer)			
11:30-13:00	Registration (Physics foyer)	Lecture ASP4	Lecture CIS3	Lecture ASP7	CIS Lab2*
13:00-14:00	Lunch (Physics foyer)				
14:00-14:15	Welcome				
14:15-15:45	Lecture ASP1	Lecture CIS1	Free afternoon	CIS Lab1*	
15:45-16:15	Coffee (Physics foyer)			Coffee (Physics foyer)	
16:15-17:45	Lecture ASP2	Lecture CIS2		Lecture CIS4	
18:30-19:30	BBQ (Medicine foyer)	RSS Reception (Physics Foyer)	Dinner (Agnes Blackadder Hall)	Drink Reception (Lower College Hall)	
19:30-20:30				Academy dinner (Lower College Hall)	
20:30-21:30					

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

Computer Intensive Statistics

Module leader: A. Q. Wang

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 on strategies for handling large datasets. The different methods will be illustrated by applications.

Learning outcomes: After taking this module, students will have an appreciation of MCMC and other simulation-based methods and of their limitations, and have some experience of the underlying theory and 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 MCMC; types of MCMC samplers; assessment of convergence/mixing; other practical considerations; case studies.
- An introduction to categorical probability and its application to MCMC.

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

Applied Stochastic Processes

Module leader: Hugo Lo

Please see the full Module Specifications for background information relating to all of the APTS modules, including how to interpret the information below.

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”.
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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).

Assessment:

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