



Masterclass

Sparse Regression

30 August – 1 September 2016



CRiSM Masterclass Sparse Regression

Organization: Joris Bierkens with thanks to Mark Fiecas

Administrative support: Olivia Garcia-Hernandez

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1 Practical Details

1.1 Conference Webpages

- <http://www2.warwick.ac.uk/sparse-regression>

1.2 Registration and Venue

- **Registration:** 9.30-10.30, Tuesday 30 August, Zeeman Building (map location H5-6), Atrium, which is located just behind the main entrance.
- **Coffee and lunch:** are provided in the Atrium of the Statistics Department.
- **Lectures:** Maths & Stats Building, MS.01. The lecture room MS.01 is located on the ground floor next to the Atrium.
- **Poster session and reception:** Tuesday 30 August, 17.00 – 18.30, Atrium. See Section 5 for an overview of posters on display.
- **Masterclass dinner:** 18.00, Wednesday 31 August, Radcliffe (map location F4). Estimated end time 21.00.
- **Breakfast (for participants with on-campus accommodation only):** 7.30-9.30 (Tue-Thu), Rootes Building. The Rootes staff has kindly agreed to keep breakfast open until 9.30 instead of the usual 9.00. However, anyone arriving after 9.00 may need to have their breakfast cooked to order to ensure it is fresh.
- **Lunch:** Mathematics and Statistics Building, Atrium.
- Dinner is not organized (with the exception of the masterclass dinner on Wednesday, for those who registered for this). Various options for dinner are available on campus (see the campus map on the back).
- **End of program:** Thursday, 15.10.

1.3 Getting Here

- Information on getting to the University of Warwick from Coventry, as well as from other directions locally and further afield, can be found at <http://www.warwick.ac.uk/about/visiting/>.
- Parking permits can be acquired at no further cost at <https://carparking.warwick.ac.uk/events/crism-master-class-on-sparse-regression>.
- See Appendix A and B for further details.

1.4 Accommodation

- Accommodation is in en-suite rooms on campus in either the Arthur Vick, Bluebell or Jack Martin residences (on the campus map, see Appendix C). Keys can be collected from the Conference Reception in the Student Union Atrium, map location E5. All rooms have linen and toiletries. Kitchen facilities are available. Rooms will be available after 15:00 for check in. All bedrooms must be vacated by 9.30 on the day of departure.
- Check in closes at 22.45. When arriving after this hour contact Conference Reception to arrange late key collection (wcpereception@warwick.ac.uk or 02476 528910).
- See Appendix A, and B for further details.

1.5 Internet Access

- **Campus:** Wireless access is most easily available via eduroam which is supported across most of the Warwick campus. Speak to one of the organisers for details of other options.
- **Accommodation:** Wireless access is available, ask for log-in details whenever you check-in to your accommodation.

1.6 Facilities - See Map

- **Supermarket, Food and Drink Outlets:** <http://www.warwickretail.com>
See <https://www2.warwick.ac.uk/services/retail/openingtimes/> for opening times.
- **Arts Centre:** <http://www.warwickartscentre.co.uk>
- **Sports Centre:** <http://www.warwick.ac.uk/sport/>
- **Health Centre:** <http://www.uwhc.org.uk>
- **Pharmacy:** Student Union Atrium

2 Help, Information & Telephone Numbers

2.1 Department

- **Address:** Department of Statistics, University of Warwick, Gibbet Hill Road, Coventry, CV4 7AL
- **Fax:** 024 7652 4532
- **Webpage:** <http://www.warwick.ac.uk/stats>
- **Organization:** Joris Bierkens, j.bierkens@warwick.ac.uk
- **Administrative support:** Olivia Garcia-Hernandez, Olivia.Garcia@warwick.ac.uk, 024 7652 2177

2.2 Emergency Numbers

- **Emergency:** Internal - 22222; External - 024 7652 2222
- **Security:** Internal - 22083; External - 024 7652 2083

2.3 Transport

- **Swift Taxis (Coventry):** 024 7676 7676
- **Trinity Street Taxis:** 024 7699 9999
- **National Rail Enquiries:** 08457 484 950

3 Timetable

All activities will take place in the Zeeman Building (map location H5-6), with talks in room MS.01 (signposted from lobby), unless otherwise stated.

3.1 Tuesday 30 August

Time	Activity	Location
9.30 – 10.30	Registration & Coffee	Atrium
10.30 – 12.00	Lecture	MS.01
12.00 – 13.30	Lunch break	Atrium
13.30 – 15.00	Lecture	MS.01
15.00 – 15.30	Coffee break	Atrium
15.30 – 17.00	Lecture	MS.01
17.00 – 18.30	Reception and poster session	Atrium

3.2 Wednesday 31 August

Time	Activity	Location
10.00 – 10.30	Coffee	Atrium
10.30 – 12.00	Lecture	MS.01
12.00 – 13.30	Lunch break	Atrium
13.30 – 15.00	Lecture	MS.01
15.00 – 15.30	Coffee break	Atrium
15.30 – 17.00	Lecture	MS.01
18.00 – 21.00	Gala Dinner	Radcliffe (map location F4)

3.3 Thursday 1 September

Time	Activity	Location
10.00 – 10.30	Coffee	Atrium
10.30 – 12.00	Lecture	MS.01
12.00 – 13.30	Lunch break	Atrium
13.30 – 15.00	Lecture	MS.01
15.00 – 15.10	Closing remarks	MS.01

4 Scope

4.1 Richard Samworth (Cambridge): High-dimensional statistical inference

Lecture 1: *Classical theory*

Review of the linear model, geometry of orthogonal projections, hypothesis testing, examples. Ridge regression.

Lecture 2: *Modern high-dimensional statistics*

Model selection via, e.g., information criteria. Definition of the Lasso and its geometry. Uniqueness of Lasso solutions. Prediction and estimation properties.

Lecture 3: *The Lasso and beyond*

Selection consistency of the Lasso. Computation. Brief discussion of other penalty functions, other models, e.g. grouped variables.

Lecture 4: *Multiple testing and Complementary Pairs Stability Selection*

Familywise error rate and Bonferroni procedure; False Discovery Rate and Benjamini–Hochberg procedure. Brief discussion of extensions. I will then use the remaining time to give an exposition of some of my own work in this area. Complementary Pairs Stability Selection is a technique for improving the performance of any existing variable selection algorithm, by aggregating the results of applying it on subsamples of the data.

4.2 Jianqing Fan (Princeton): Sparse Statistical Learning and Inference

High-dimensionality and Big Data characterize many contemporary statistical problems from genomics and genetics to finance and economics. We first outline a unified approach to ultrahigh dimensional variable selection problems and then focus on penalized likelihood methods which are fundamentally important building blocks to ultra-high dimensional variable selection. We will also introduce variable screening methods as well as methods for guarding against spurious discoveries. Algorithms for solving penalized likelihood methods as well as Big Data computing will also be introduced. Topics to be covered include:

1. Sparse Learning via penalization
 - 1.1 Introduction
 - 1.2 Penalized Quasi-likelihood
 - 1.3 Properties
 - 1.4 One-Step Estimator
 - 1.5 Analysis of Decomposable Regularization
2. Screening and Selection
 - 2.1 Independence Screening
 - 2.2 Iteratively Independent Learning
 - 2.3 Conditional Sure Independence Screening
3. Control of Algorithmic Complexity and Statistical Error
 - 3.1 Introduction
 - 3.2 Overview of Gradient Methods
 - 3.3 Iterative Local Adaptive MM
 - 3.4 Theoretical Properties
 - 3.5 Numerical results
4. Distributed Estimation and Inference
 - 4.1 Introduction
 - 4.2 Summary of Ideas and Results
 - 4.3 Distributed statistical inference
 - 4.4 Distributed estimation
 - 4.5 Simulation performance

5 Posters

1. Non-Concave Penalized Log-Likelihood in Linear Mixed-Effect Models and the Regularized Selection of Fixed Effects

Abhik Ghosh
University of Oslo

2. Interpolation between Compact Binary Population Synthesis Models

Jim Barrett
University of Birmingham

3. Representing sparse Gaussian DAGs as sparse R-vines allowing for non-Gaussian dependence

Dominik Mueller
Technical University of Munich

4. Degrees of Freedom for Piecewise Lipschitz Estimators

Frederik Riis Mikkelsen
University of Copenhagen

5. Clustering with a Reject Option: Interactive Clustering as Bayesian Prior Elicitation

Akash Srivastava
University of Edinburgh

6. Functional Inference

Diego Granziol
University of Oxford

7. Inference on covariance operators via concentration inequalities

Adam B Kashlak
University of Cambridge

8. Empirical comparison of penalised linear regression methods in high-dimensional settings

Fan Wang
University of Cambridge

9. Efficient Sampling in Bayesian Unlabelled Shape Analysis

Anamul Haque Sajib
University of Nottingham

10. Misleading Metrics: On Evaluating Machine Learning for Malware with Confidence

Roberto Jordaney
Royal Holloway University of London

11. Learning X given Y , in the absence of Training Data

Cedric Spire
University of Leicester

12. Distinguishing Distributions with Interpretable Features

Wittawat Jitkrittum
University College London

13. RSPINN: Redshift Space Power spectrum Interpolation with Neural Networks

Joey Faulkner
University of Edinburgh

14. Conditional density estimation of mixed continuous and categorical data

Lena Reichmann
University of Mannheim

15. Survival prognosis and variable selection: A case study for metastatic castration resistant prostate cancer patients

Søren Wengel Mogensen
University of Copenhagen

16. Testing for association between RNA-Seq and high-dimensional data

Armin Rauschenberger
VU Medical Center Amsterdam

17. Unbiased estimation of the volume of a convex body

Nikolay Baldin
University of Cambridge

18. Misleading Metrics: On Evaluating Machine Learning for Malware with Confidence

Kumar Sharad
Royal Holloway

6 Participant List

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Continued on next page

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Delegate Joining Instructions Warwick Conferences Conference Park

We are delighted that you will be joining us at the University of Warwick. Please bring these instructions with you as you will find them useful whilst you are on campus.

Getting to campus and car parking:

- The Conference Park is situated on the **Central Campus** of the University of Warwick located on the outskirts of Coventry with good transport links
- Download further information from the website at www.warwickconferences.com following the link 'how to find us'
- A further link can be found for any relevant traffic information at <http://www.warwickconferences.com/delegates/delegates-conference-park>. The Conference Park is the name given to the facilities provided by Warwick Conferences on the **Central** University campus
- Complimentary car parking is available for conference delegates in any of the **Central** campus non-barriered car parks (shared use)
- Your Event Organiser will send you the link to our car parking permit website where you can register, download and print your permit which is to be displayed in your vehicle
- Accessible parking spaces are available in all car parks
- Please inform your Event Organiser if you require an accessible parking space close to your accommodation (blue badge holders only)

Accommodation:

- Please check with your Event Organiser which type of accommodation has been reserved for your event

Conference Reception:

- Located within the Atrium of the Student Union building
- Our Reception team are available to answer any queries between 07:00 – 23:00
- A left luggage store is available in Conference Reception

Bedroom Keys:

- You will be provided with a key or key card which will access your room and entry door to the residence
- On the day of departure, keys can be left at Conference Reception (in the Students Union building), Rootes Restaurant (in Rootes Building) or one of the boxes situated in the entrance halls of each residence

Bedroom check in/out:

- Bedroom keys will be available from 15:00 to 22:45 at Conference Reception
- If you plan to arrive after 22.45, please contact Conference Reception to arrange late key collection wcpreception@warwick.ac.uk or 02476 528910
- Rooms need to be vacated by 09:30 on your day of departure. Luggage and belongings should be removed by that time
- Please inform Conference Reception on arrival, of any difficulties you may have in the unlikely event of an evacuation from your accommodation

Wi-Fi access across Central campus:

- Conference Park delegates can access the "Warwick Guest" Wi-Fi network around campus and within their accommodation. Ask at Conference Reception or any member of the team for assistance if required

Food and Drink:

- All meals are provided in Rootes Restaurant located on the first floor of Rootes Building for all delegates (unless your programme indicates otherwise)
- The restaurant offers breakfast, lunch and dinner including a range of hot and cold drinks
- Please have with you your conference badge or room key to gain access to the restaurant
- Please inform your Event Organiser if you have a specific food allergy or a lifestyle dietary requirement (for example: vegan, vegetarian, halal or Kosher)
- Bar facilities are located on the first floor of Rootes Building and is the ideal place to network and relax after a day's session. There are alternative bars in Warwick Arts Centre and Students Union building (check opening times locally)

Shops, Banks and Cafés on Central campus:

- The campus has a range of facilities available to all delegates, for information and opening times please see the website: <http://www.warwickretail.com>
- Warwick Arts Centre cinema offers discounted cinema ticket prices, which can be purchased from the box office. Proof of delegate status is required
- There are branches of Barclays and Santander, both have cash machines in the Students Union Atrium (directly next to Rootes Building). There is also a cash machine outside Rootes Grocery Store

Chaplaincy:

- Catholic mass takes place in the Chaplaincy on central campus on Sundays throughout the year at 12:30 and conference visitors are welcome to join the service.
- Muslims wishing to pray can request access via Conference Reception for the Islamic Prayer Halls on Central campus.

Sports facilities:

- Guests have free unlimited access to Warwick Sport's premium leisure facilities on campus.
- Opening hours are 07:00 to 21:30 (Monday to Friday) and 08:15 to 19:30 (Saturday and Sunday)
- 25metre swimming pool and sauna
- State of the art gym
- Running track
- Other sports facilities that can be used but at additional charge are:
 - Tennis Centre with 4 indoor and 4 outdoor courts
 - Climbing Centre with 14m high walls and a bouldering room
 - Sports halls for basketball, 5-a-side football, netball or volleyball
 - Outdoor astro or grass pitches for football, rugby or cricket
- You will be required to show your bedroom key or delegate badge to access the facilities
- Lockers are available and require a £1 coin and towel hire is available at a minimal charge
- To make a booking or for further information - call the Sport Centre Reception on 23011 from any internal phone or 024 76523011 externally;
email warwicksport@warwick.ac.uk website www.warwick.ac.uk/sport

For more information: You can also refer to our Frequently Asked Questions document (FAQ's) which can be obtained from our website: <http://www.warwickconferences.com/delegates/delegates-conference-park>

Frequently Asked Questions Warwick Conferences Conference Park

Where is the University of Warwick?

- Four miles from Coventry City centre at the hub of the central motorway network

What is the Conference Park?

- The name given to the facilities provided by Warwick Conferences on the main University campus
- Once you arrive on campus please look out for the Warwick Conferences signage to direct you to the car parks and conference venues

Where is the nearest Mainline Rail Station?

- Coventry Intercity station is only four miles from the University

Is there a taxi rank on campus?

- Taxis are available on Health Centre Road opposite Warwick Arts Centre at most times of the day. Alternatively you can contact Conference Reception on 02476 528910 for more information and relevant phone numbers

Can I travel by bus from Coventry Railway Station or Bus Station?

- The number 12 bus runs from Coventry Bus Station via Coventry Train Station to the University

If I have a minibus or high sided vehicle – where can these be parked?

- It would be advisable to let your Event Organiser know of your requirement for specific car parking, as the majority of University car parks are multi storey

I have a particular special dietary need – can you manage this?

- Please inform your event organiser if you have a specific food allergy or a lifestyle dietary requirement (for example: vegetarian, vegan, halal or Kosher)

Will we stay in halls of residence?

- All Conference Park accommodation is student style using either standard or en-suite rooms. Your Event Organiser will be able to advise the type of accommodation you have been allocated

Do any of the residences have lifts?

- Some residences do. If you have a particular requirement then please discuss with your Event Organiser

What electrical supply is available in the bedrooms?

- Electricity is supplied at 220/240v and 50 cycles AC. Adaptors are available to purchase in Rootes Grocery Store on Central campus

Are there any laundry facilities on campus?

- A launderette is situated between Rootes Building and Rootes residences, opening times are available from Conference Reception for self-service washing and drying
- All machines and driers are operated using a card payment system which can be purchased from the launderette at a cost of £10 (£2 for the card and £8 of available spend for use on machines or driers)
- Washing powder and softener is not provided. You can purchase this from Rootes Grocery Store on Central Campus
- A dry cleaning service is available in Rootes Grocery Store and the Chemist situated in the Student Union Atrium

Will I have access to a kitchen within my accommodation block?

- Each delegate will have access to a shared kitchen. Please note these areas will not contain any cooking equipment or utensils

If I have any lost property during my stay who do I contact?

- Contact Conference Reception on 02476 528910 who will be able to assist

Are religious services available on campus?

- A chaplaincy is available to all University visitors. Catholic mass takes place in the Chaplaincy on central campus on Sundays throughout the year at 12:30 and conference visitors are welcome to join the service.
- Muslims wishing to pray can request access via Conference Reception for the Islamic Prayer Halls on central campus.

Where can I access my emails?

- Conference Park delegates can access the Warwick Guest Wi-Fi network around campus and within their accommodation. Please ask at Conference Reception or any member of the team for assistance if required
- Computers are available at Conference Reception for guest use

If I am having mobility problems is there anything you can do to help?

- Mobility scooters are available for guests; please ask at Conference Reception for more information

What should I do if I feel unwell?

- Please contact Conference Reception on 02476 528910, who will ensure a message is given to your Event Organiser. We do not have a resident doctor available for conference delegates, but in the event you require a first aider, this can be done via our 24 hour Security Team on 02476 522083. Alternatively there is a Walk-In Medical Centre in Coventry – <http://cityofcoventrynhshealthcarecentre.nhs.uk/>

Is there anywhere on campus I can buy toiletries or get pharmacist advice?

- There is a pharmacy located in the Students Union Building and Rootes Grocery Store also sells a variety of items. These buildings are located next to Rootes Building

Are there any cash machines or banks on campus?

- There are branches of Barclays and Santander, both have cash machines in the Students Union Atrium (directly next to Rootes Building)
- There is also a cash machine outside Rootes Grocery Store

Where are the nearest shops to campus?

- There are a number of retail shops on campus; a grocery store, post office, pharmacy, bookshop and hairdressers
- Cannon Park Shopping Centre is within a ten minute walk and has a large supermarket and several smaller retail shops

What is there to do in the local area?

- Warwick Arts Centre is situated on Central campus and houses a cinema with reduced rates for Conference delegates
- You will find bikes for hire on site – a great way to see the local area. See the website for more information: <http://www2.warwick.ac.uk/about/environment/transport/cycling/uni-cycles>
- Coventry city centre is only four miles away and Warwick, Stratford Upon Avon and Leamington are nearby

What signage should I look out for on campus?

- University Signage – these are positioned around campus highlighting all Academic Buildings and social spaces – they are white rectangular blocks
- Warwick Conferences signage is in place around campus to highlight particular buildings used for Conference Events

