

Synchronous Online: Start 12pm, Wednesday 21st October

MAS2905: Probability and Bayesian Methods with R

Newcastle University
`lee.fawcett@ncl.ac.uk`

Semester 1, 2020/21

Chapter 1

General Housekeeping

1.1 Lecturer information

The module leader for MAS2905, and lecturer for both semesters, is Dr. Lee Fawcett

- Lee is based in room 2.07 on the second floor of the Herschel Building (in a non-Covid world)/in his Lego Room (at all other times)
- If you have any questions about the module he can be contacted via email: lee.fawcett@newcastle.ac.uk
- Feel free to post a query to the module Canvas page
- Or you are welcome to schedule a 'face-to-face' Zoom meeting

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There will be several other people assisting with this module in semester 1, primarily in the computer practical sessions.

They're all really friendly PhD students – **Kieran**, **Tom**, **Sophie** and **Amy**. Give them a shout in class if you're stuck with anything!

Photos to be inserted here.

1.2 Classes

Will hold off for now!

1.3 Schedule

A detailed week-by-week schedule to appear here. Again, will hold off for now!

1.4 Assessment

The full 20 credit MAS2905 module will be assessed via a formal written examination in summer 2021 and some in-course assessment (ICA).

The make-up is **50% summer exam, 50% ICA**

- Summer exam – 100 marks in total

- Semester 1: Section A (20 marks)
- Semester 2: Section B (80 marks)
- Answer *all* questions in *both* parts

- ICA – 100 marks in total

- Semester 1: One homework (20 marks), two tests (60 marks)
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1.5 Late work policy

Late work policy to be inserted here.

1.6 Course materials

All course materials will be posted to the **dedicated Canvas page** for MAS2905. Here, you will find:

- A full copy of the lecture notes you might be looking at now, with gaps
- A copy of the lecture notes with the gaps filled in, after the associated PiP/SO/NSO activities
- These slides used to support PiP/SO/NSO activities after these have taken place
- All video recordings
- Solutions to assessed exercises
- Any other materials, including additional handouts/worksheets, links to useful Numbas material, specimen exam papers and solutions, ...

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1.7 Books and other resources

At various points in the module you will be directed to additional reading, should you want extra examples or just another source of information relating to the material presented in the notes.

This will primarily be text books (many of which are available to view online), but perhaps other sources (e.g. journal publications, magazine articles etc.).

1.7 Books and other resources

Some useful books for semester 1 include:

- W.N. Venables and D.M. Smith: [An Introduction To R](https://cran.r-project.org/doc/manuals/R-intro.pdf). Free to download at:
<https://cran.r-project.org/doc/manuals/R-intro.pdf>
- D. Braun and D.J. Murdoch: [A First Course In Statistical Programming With R](#)
- S. Ross: [A First Course in Probability](#)
- N.A. Weiss, P.T. Holmes and H. Michael: [A Course In Probability](#)

1.8 General background for Part 1 of MAS2905

In Part 1 of the module we will learn about computational tools for performing probability calculations and statistical analysis.

We will use the R programming language.

R is very widely used in universities, businesses and other organizations due to its many advantages over other similar software packages.

- It is available for **free**
- It is '**open source**' and can be used for a very wide range of statistical and scientific applications
- **Libraries** of R functions and data-structures have been created and are readily available on the web

Make sure you always have RStudio open, and read-to-use, during all timetabled sessions in semester 1.

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Learning to use R is important because:

- (i) It is the foremost tool in modern computational statistics
- (ii) It is a great way to learn general concepts in programming which can be used with other languages or in other contexts
- (iii) It can be used to illustrate ideas in probability and statistics

In MAS1802 last year we focused mainly on point (ii) above; in this module, we focus mainly on points (i) and (iii).

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Strikes, COVID-19 and Joint Honours/Major-Minor students

- This course would normally rely on a full understanding of material in MAS1802
- Strike action, and then COVID, might have put pay to that!
- We also have quite a few JH/MM students joining this course
- Don't worry! 2 week R Refresher/Intro!

Rough structure of the course

- Weeks 1–2: R Refresher/Intro
- Weeks 3–5: Statistical Methods: Simulation/Transformations
- Weeks 6–8: Statistical Methods: Bivariate distributions
- Week 9: Simulation studies in R

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Quiz #1



Do you think you would benefit from a detailed coverage of the material in *Chapter 2: R Refresher*?

1. Yes
2. No
3. Not bothered either way

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All materials for semester 1 of the module are in the main booklet:

- **Background theory** – some of which you will be expected to read yourself through NSO activities
- **Pencil-and-paper exercises** – some of which you will try out yourself in NSO activities, and some of which we will work through together in SO sessions
- **Computer practical exercises** – some of which you will try out yourself in NSO activities, and some of which we will work through together in our PiP sessions in the computer cluster

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- It is even more important that you follow instructions on Canvas and complete the other activities by the dates suggested – if you are told that some NSO activities should be completed before the next PiP computer practical, then make sure you do exactly that!
- **General message: Make every effort to engage with the activities set and keep to the schedule. And ask Lee if you're not sure about anything!**

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MAS2905: Information for JH students

- R: Industry standard software for statistical analysis – free, brilliant graphics capabilities, add-on libraries, **RStudio**
- We realise you will likely not have any experience of using R / RStudio
- Fear not! SH students don't have that much experience themselves, this year...!
- First two weeks of MAS2905: "R Refresher", covering the basics of RStudio from MAS1802
 - Data types
 - Vectors
 - Dataframes
 - Graphical and numerical summaries
 - Functions, for loops and if statements

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- If that's too much, try our condensed version!

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