MSC IN DATA SCIENCE AND ANALYTICS

MAYNOOTH UNIVERSITY

STUDENT HANDBOOK 2022-2023

INTRODUCTION

This MSc is a full-time 12-month conversion course (started in 2017) designed to prepare students for the fast expanding job market in Data Science and Analytics. Students will gain the knowledge and skills to collect, process, analyse and visualise data in order to extract useful information, explore patterns and evaluate models. The course is a collaboration between the Departments of Mathematics & Statistics, Computer Science and the National Centre for Geocomputation.

Modules cover programming, statistics and databases, and advanced topics in modern statistical machine learning. The course includes material on the social and ethical consequences of the use of data and the implications for business and government. Applications from many industry sectors will be explored in our Case Studies module. In the Project module, students will put these technical skills into practice. They will gain experience in report writing, presentations and teamwork. Students also do a 30-credit thesis.

Applicants must have a recognised primary degree which is considered equivalent to Irish university primary degree level. The degree should be at level 8 in any subject and should include course work in Differential and Integral Calculus, Linear Algebra and Probability and Statistics.

Please visit Maynooth University International Office website for information about English language tests accepted and required scores. The requirements specified are applicable for both EU and non-EU applicants.

MODULES

Module	Topic	Semester	Credit	C/O
CS620C	Structured programming	1	10	O
CS621C	**Spatial databases**	**1**	**10**	**C**
ST661	**R for data analytics**	**1**	**5**	**C**
ST633	**Linear models**	**2**	**5**	**C**
ST645	**Bayesian data analysis**	**1**	**5**	**C**
DS663	Statistical methods for data science 1	1	5	O
CS401	Machine learning and neural networks	1	5	O
CS322	Music programming 2	1	5	O
NCG612	**Case studies in data science and analytics**	**2**	**5**	**C**
NCG613	Data analytics project	2	5	O
NIR605	Critical data studies	2	5	O
ST644	**Statistical machine learning**	**2**	**5**	**C**
ST634	Generalised linear models	2	5	O
ST662	Topics in data analytics	2	5	O
CS615C	Internet solutions engineering	2	10	O
ST606 NCG616 CS648	**Masters Project and Dissertation**	**Summer**	**30**	**C**

C= Compulsory module, O= Optional module

CHOOSING MODULES

Module details and descriptions are on the University course finder. From this page, click on 'Year 1' and then 'Data Science and Analytics'. Follow links to modules for descriptions.
CS620C is an intensive programming course beginning August 29 (in 2022) running for 3 weeks, from 9am to 5pm each day. It is required of those who do not have a sufficient programming background. All other semester 1 modules begin in the week of September 19, 2022.

In semester 1, all students should take the required modules CS621C (10), ST661 (5), ST633 (5), and ST645 (5). Students without a programming background should also take CS620C (10). Students with little or no background in Statistics should take DS663 (5). Other options are CS401 (5) and CS322 (5) (for those with an interest in music). Please register for 30/35 ECTS in Semester 1. This choice does not have to be finalised until the third week of the semester, but we advise you to register before the start of the semester.

In semester 2, the required modules are NCG612 (5) and ST644 (5). There are a further 30 available credits, from modules ST662 (5), ST634 (5), NCG613 (5), NIR605 (5) and CS615C

(10). Students should select enough modules from this list to bring the taught module credit total to 60.

For the thesis, all students should choose **one** of ST606, NCG616 and CS648. For now, it is a free choice, but we will ask you to revise this choice early in semester 2. For all second semester modules and the thesis, students do not have to finalise their choices until February.

Students are welcome to discuss their module choices with the Course Director (Katarina.Domijan@mu.ie) prior to the start of both semesters.

LOCATIONS

The MSc is jointly offered by the Department of Mathematics and Statistics, located in Logic House, South Campus, the Department of Computer Science located in the Eolas Building, and the National Centre for Geocomputation (NCG) located in Iontas, both on the North Campus.

LECTURES

The official start of term is Monday, September 19, 2022. International students are advised to arrive in Maynooth well in advance of this date. For students talking CS620C, lectures begin on August 29 2022. You will find information on key term dates here. Module timetables will be available early in September, check here. Some modules will have additional tutorials. Lecturers will advise you of this on the first day of class. Attendance at lectures, labs and tutorials is required.

ASSESSMENT

Students will find assessment information for modules on course finder. The lecturer will give you more details at the start of the semester. Module pass marks are either 40% or 50%. Pass by compensation is allowed in some cases when students obtain a mark of at least 35%. The University Marks and Standard document explains this.

EXAMS

Some modules are examined by continuous assessment or in class exams. Others are examined during the official University examination periods which are two weeks in January and two weeks in May. Check the key term dates link for details.

PLAGIARISM

Students should make themselves aware of the University policy on plagiarism.
To understand a bit more about plagiarism and how to avoid it there is lots of material on the web. For example http://nuim.libguides.com/referencing/home . You can check your work on turnitin.

STUDENT SUPPORTS

- The University has a Career development centre, which offers career related talks and employer presentations.

- There is also a general student services office, which has links to information on finding accommodation, student health and budgeting.

MOODLE

Moodle is Maynooth University's online learning environment. To log in to Moodle, you need to enter your Maynooth University username and password in the login area. You will find material there related to your modules.

COMPUTERS

The University IT services website has information about email accounts, and the publicly available computer labs and wifi.
MSc students will also have accounts for the computer labs in Logic House.

MSC THESIS

The project or thesis is an important part of the MSc, making up 30 credits out of a total of 90. Students will carry out projects under the individual supervision of a staff member in Mathematics & Statistics, Computer Science or the National Centre for Geocomputation. Initial work on the project will begin in the Spring semester. Once course work and exams are finished in May, you will commence working full-time on the project. A written dissertation must be submitted by August 4th, 2023.

CHOOSE ONE OF M&S, CS, NCG

Students will choose one of the three Departments on Moodle in the first week of Semester 2, on or before Friday, February 4th, 2023. Students must change their official University registration to reflect this choice. Each Department will then allocate students to projects.

THESIS COMPLETION

The deadline for submission of the thesis is August 4, 2023 at 4pm.

The remainder of this document applies to those selecting ST606 only.

ST606 THESIS MODULE

Students choosing this module will receive a project topic and supervisor by Friday February 17. Alternatively, we encourage students to identify their own Data Science research project. Such students must submit a one-page project outline to Dr. Catherine Hurley to assess its suitability on or before February 10, 2023.

MARCH-MAY

Students begin working on their project. They may use their own computers or any MU lab. There will be an initial planning meeting with your supervisor, and about four other meetings. Students are advised to keep in regular contact with their supervisor.

JUNE-AUGUST

Students will work full time on their project. There will be about four further meeting with supervisors. Labs in Logic House will be available to students in this period.

MID JUNE

Students will give a short presentation on their project on a date to be arranged in mid June. The presentation will be worth 10% of your total grade. The presentation will be an opportunity for you to share your work with your fellow students and hopefully you will get valuable feedback from staff members and students.

Students will submit an interim project report to their supervisor before June 23 2023. This should be about six pages long. It should describe the project, methods you are using, any results so far, and what your plans are for completing the project in the remaining two months. This report will not contribute to the mark for the thesis, it is for guidance and feedback to help your progress.

THE DISSERTATION

The project is assessed on the basis of a final written dissertation. Additional material, such as the code you submit, will also be taken into account. All the work you have done should be carefully described in the dissertation document. Dissertations will typically conform to the following format:

- The length should be about 25 -- 45 pages in total, including all text, figures and appendices.
- The document must be produced with Latex, Word or Markdown, with a line spacing of 1.5.
- Use the cover page to be supplied on Moodle. The thesis should use double-sided printing and be soft-bound.

Content should include the following sections:

- A title page with abstract.
- Introduction: an introduction to the document, clearing stating the objectives of the project, motivation for the work and a brief summary of the results achieved. The structure of the remainder of the document should also be outlined.
- Background: background to the project, previous related work, description of relevant literature, explanation of how your project relates to previous work. This should contain sufficient information to allow the reader to appreciate the contribution you have made.
- Description of the work undertaken: this may be divided into chapters describing the conceptual design work and the actual implementation separately. Any problems or difficulties and the suggested solutions should be mentioned. Alternative solutions and their evaluation should also be included. If there are challenges related to the nature of the data, its size, data errors or missing values, any steps you take to deal with this should be explained and justified.
- Analysis or Evaluation: results (including visualisations and models) and their critical analysis should be reported, whether the results conform to expectations or otherwise and how they compare with other related work. Where appropriate evaluation of the work against the original objectives should be presented.

- Conclusion: concluding remarks and observations, unsolved problems, suggestions for further work.
- Bibliography and references: You should use a standard referencing style such as Harvard, see this document for details. Referencing software such as Endnote is helpful here. MU has subscription to Endnote Online. This link explains referencing in R markdown.
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- This link from MU library gives information on avoiding plagiarism and proper use of references.
- Snippets of code may be included in the text of the document. Larger amounts of code should be part of an Appendix.

Students should be aware of, and observe, the MU plagiarism guidelines. Please also check your work on the plagiarism checking software turnitin, available via Moodle.

SUBMISSION

Upload an electronic copy of the thesis as a pdf to Moodle under ST606 and a zip or tar archive containing all project materials and code by August 4th 4pm, 2023. It should be possible for the reader to reproduce any parts of the analysis / results presented using the code provided.

PROJECT ASSESSMENT

Your submitted work will be assessed using the following criteria:

- Understanding of problem
- Quality of work and problem solution
- Quality of written dissertation including clarity, structure, organisation, references and bibliography
- Literature review and understanding of context
- Critical evaluation of work, reflection
- Conclusions, relationship to aims and objectives
- Complete submission of working code
- Evidence of outstanding merit