Imperial College London

IMPERIAL COLLEGE LONDON

SCHOOL OF PUBLIC HEALTH

Research Project
Module Handbook

MSc Health Data Analytics and Machine Learning

Term 3

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Contents

1 Outline of the Research Project

The Research Project is a core module on the MSc Health Data Analytics and Machine Learning. It is structured to provide you with an opportunity to apply key concepts developed previous modules, to address a real and urgent research gap, using real world data. In addition, it provides training in key research techniques.

The project should culminate in your completion and submission of a report, in the style of a journal article. It will contain a well-guided literature review, a well-defined research question or hypothesis and carefully constructed methods for investigation of such a question. This is a small-scale project which should be completed, from design to execution, write-up and presentation, in four calendar months (full-time students).

You will have very limited, if any, funds to conduct this project. In planning your project, you need to be aware of these time and funding limitations. For these reasons, we recommend that you consider carrying out a secondary analysis of existing data rather than undertaking primary data collection.

The aims of this document are to:

- Assist you in understanding the size and scope of the research project;
- Assist you in pacing your activities in planning, carrying out and writing up your research; and,
- Provide guidelines for writing a clear and concise research report.

1.1 Specific requirements for the MSc in Health Data Analytics and Machine Learning

Any research project report for the MSc in Health Data Analytics and Machine Learning should demonstrate rigorous application of advanced statistical and machine learning methods in the context of public health. Findings should be interpreted in relation to the research objectives of the study. Suitable research project topics usually fall into the following categories:

- Exploration and analysis of data relevant to a specific health problem on which statistical and or/machine learning methods can be applied to understand relevant scientific questions;

- Mathematical modelling of the spread of diseases;

- Statistical simulation of datasets to test/investigate methods or problems with the intention of applying said methods to a real dataset/real problem.

Please note the above is not prescriptive and some projects do not fall into those categories. You can submit your own project to the course team. These will need to be approved and require an Imperial College supervisor.

2 Module aims and learning objectives

At the end of the research project, you will be able to:

1. Formulate and propose an original and relevant research question from a complex data set.

2. Explore and analyse a complex data set to assess its quality and its potential.

3. Deploy/exploit databases under all necessary quality/security/privacy standards.

4. Design and implement a complex analytical plan using methods borrowing from OMICs profiling and Machine Learning approaches.

5. Critically appraise results and adapt the analytical strategy accordingly.

6. Fully interpret results from the data analysis, including the production of efficient visualisation of the results.

7. Write and present a scientific report which effectively communicates the research conducted throughout the project.

3 Module structure

The Research Project is structured to provide you with an opportunity to apply key concepts learned and developed in previous terms. Guided by a critical literature review and supported by supervision from academics in the department and through summer project support seminars, you will define a research question or hypothesis and carefully construct methods to investigate it. This project should be completed, from design to execution and write-up, in four calendar months.

The following learning and supervision hours are scheduled for this module:

Table 1

Learning & Teaching Hours	Independent Study Hours	Placement Hours	Total Hours
25	725	0	750
ECTS Credit	30	CATS Credit	60

4 Selecting a research project and the selection process

A list of possible projects has or will be uploaded on Blackboard. You may choose to carry out one of these projects. Alternatively, you are welcome to propose your own research idea and develop a project in conjunction with an appropriate member of academic staff. All proposed projects are reviewed by a panel of assessors to determine their suitability.

You are responsible for your own research question and should not be directed in this by the interests or methods of the original data collector(s).

When selecting a project there are several things you should consider and these often involve answering the following questions:

- Is there any particular public health area/issue/problem you want to focus on?
- Are there any particular methods you want to become more familiar with?
- Is there or are they any specific supervisors you want to work with?
- Do you want to work on an industry project or an academic project?

Once you have thought about these questions and have narrowed down a few projects that you'd like to work on, the HDA team will then ask you to rank three of those and submit your choices in a dedicated online form. Then, the process below, with supervisors and students, commences:

1. Supervisors are given a list of interested students.
2. Supervisors interview students.
3. Supervisors come back to the HDA team with the name of the student or students they would like to proceed with.
4. The HDA team communicates with the student and asks if they are happy to proceed. If so, then the project goes ahead. If not, then the process restarts and is continued until the student and supervisors are happy.

5 Research ethics

You are advised to discuss the ethical implications of the proposed research with your potential supervisor before you select it as your research project. If you are required to obtain approval from a research ethics committee, you should apply for ethics approval as early as possible or consider selecting an alternative project. Generally this is not required for HDA summer projects, however, please read the below information in case you are concerned or are interested in setting up your own project.

All researchers – students and professionals – are obliged to consider the ethical implications of their proposed studies. For NHS based research, you are required to apply to a NHS research ethics committee for a favourable opinion before you proceed with the research. For health-related research involving human participants and/or their data (but not within NHS remits) you should apply to the Imperial College Research Ethics Committee (ICREC). For non-health-related research, or research conducted outside the NHS, there is currently no absolute or universally agreed system for determining what will be required to obtain approval for a research project. The following book provides a good introduction to ethics in social science research: Paul Oliver (2010) The Student's Guide to Research Ethics (Maidenhead: Open University Press).

If your proposed study does fall under the remit of the NHS Research Governance/ Clinical Trials Regulations and you apply for ethics committee approval, you should include a copy of the committee's letter approving your research as an appendix in your dissertation.

N.B. For UK studies of NHS staff, the ethics rules have been relaxed (2012). The latest guidance states that: "REC review is not normally required for research involving NHS or social care staff recruited as research participants by virtue of their professional role. (...). Exceptionally, the Research Ethics Service may accept an application for review of research involving staff at the request of the sponsor, chief investigator or host organisation, where it agrees that the proposal raises material ethical issues".

See Section C1 of PDF document on NRES website, accessed through the 'Do I need NHS REC approval?.

You should be aware that obtaining ethics approval could be a lengthy process, long enough to prevent a project being completed within the academic year. Ethics committees may reject applications that are incomplete or inadequate in any way. It can take up to 60 working days to gain an approval even for a complete and adequately presented research ethics committee application form. Under no circumstances should research be conducted where ethics approval has been denied. Students considering a change in direction for their projects should know that Ethics Committees must be informed about any change to approved study designs. Any proposed changes will need to be approved before research is conducted. Substantial changes will require a completely new application. Changes to the project design thus involve extra work and will delay the start of projects. It is therefore in students' interests to design a sound study that they will be able to carry out without revision.

Research projects to avoid for dissertations:

The time involved in obtaining ethical approval and potential for a rejected application to delay or prevent a research project from being carried out means that you should be wary of deciding on a research design that will:

- Involve human subjects in an NHS setting (patients and their families)
- Involve people who may be considered vulnerable because they are distinguished from the general population by some status or group membership e.g. drug users

- Gather personal details or focus on sensitive issues
- Survey or interview patients/ people receiving treatment, advice, or social care
- Use identifiable medical records
- Use datasets that allow record linkage or any possible identification of individuals by deduction
- Study tissue samples
- Involve the use of drugs
- Involve animals

Research projects that do not require approval from an external committee:

- Projects that use only evidence that has been published or is available to students from libraries or other public document sources
- Projects that use only data from existing sources (secondary data)
- Projects that only use hypothetical data (e.g., simulation or most modelling projects)

6 Support for your project

The research project is a substantial piece of independent work, and something to be proud of. Many graduates give the title of their research project or a brief outline of it in their CV. Students who are interested in taking research degrees for MPhil or PhD will also find that considerable interest is taken in their MSc research project. As you prepare your research project, you should see yourself as a junior researcher gaining experience in a university setting. You will be guided through this process by your research project supervisor and will have opportunities to present your findings at seminars and research team meetings.

6.1 Responsibilities for students, supervisors and course team

Students

- Ask relevant questions to ensure that the project is viable and a good match to your interests and abilities.
- Ensure there is a reasonable amount of time available in personal schedules to complete the research project report within the recommended timetable.
- Set achievable goals to guide your project and write up.
- Meet the research project milestones set for each term.
- Monitor your progress and keep your supervisor informed of your progress.
- Organise and attend at least 2 meetings per month with the project supervisor (ensure supervisor's annual leave and time away from the office is accounted for in your study plan).

You should attempt to tie in your supervision sessions with the research project milestones. A **suggestion** of the format for organising supervision sessions is as follows:

- **Pre-project meeting(s):** Student and supervisor agree to work together on the project; supervision meeting dates and times are agreed for the project period including dates for submission of a draft of the dissertation for supervisor feedback; availability of data is confirmed and any problems with data availability should be brought to the attention of the Course Organiser.
- **Supervision meeting 1:** Provisional project proposal: student and supervisor critically discuss the project outline and establish that data are available. If data are not available at this point the student should discuss options for alternative projects with the Course Organiser.
- **Supervision meeting 2:** Key findings from the literature and review of methods - student presents key findings, and student and supervisor discuss any revisions of proposal as needed. Student discusses any training needs.
- **Supervision meeting 3:** Exploring and cleaning of data

- **Supervision meeting 4:** Data analysis - discuss results
- **Supervision meeting 5:** Overall discussion

In addition to the above, Imperial College Graduate School asks that students:

- who are carrying out summer projects with external organisations to adhere to a general code of good practice. Students are expected to communicate with the internal co-supervisor regularly and to meet with them at least 2 weeks before the submission deadline to review progress;
- complete and submit the research project report by the deadline;
- submit supervision record forms on time after each meeting with the supervisor;
- report any serious concerns about supervisors to the Course Organiser;

Research project supervisor

- To be available to meet their student at least twice a month for project supervision. This can take the form of face-to-face meetings, online video conference, phone calls, emails or review of student work.
- Assist the student in developing a project of suitable size and scope for the research project.
- Monitor the student's progress.
- Encourage the student to discuss any major disruption or delay in achieving the research project milestones with the Course Organiser.
- Provide timely feedback (within a 2-week time frame for any piece of written work that has been submitted for comment).
- Keep a record of the supervision sessions and notes of meetings and phone conversations.
- Expect to read one draft of the full research project report, if it is submitted in good time, and provide constructive feedback on general standard and focus. The supervisor should avoid doing the work for the student.

- Organise for a well-qualified co-supervisor to meet the student if the main supervisor is expected to be away from the college for more than two weeks at any time.

Course organiser, Teaching Fellows and Course Administrator

- Collect project ideas from internal and external supervisors
- Propose/introduce potential internal supervisors for student devised projects
- Monitor progress of projects
- Make arrangements for the oral examinations and markers for the dissertation
- Compile final marks and comments from markers and report these to the final exam board meeting
- Support students and advise on any personal difficulties that they may encounter during the process of working on the dissertation. Prepare individual feedback reports of dissertation markers' comments and provide these within a few weeks of completion of the course to the students and supervisors

7 Mid-point project presentation

The mid-point project presentation takes place a few weeks into the project period and is an opportunity for the course team to assess your progress, and for you to receive feedback on you project plans and timeline. The presentation forms is mandatory but formative for HDA, meaning that it will not contribute to your mark but you are expected to attend. You will have 5 minutes to present, followed by 10 minutes for questions and feedback.

Your presentation should include:

- Summary of research background and literature review
- Clearly defined research question and rationale
- Clear aims and objectives
- Proposed methods for addressing the research question, and any preliminary findings

- A GANTT chart displaying your proposed timelines for each activity to be completed, up to the dissertation submission

Presentations will take place in the week of **5 June 2023**. Exact details will be announced by the Education Team.

8 Guidelines for writing and submitting your report

WARNING: The process of writing and submitting a research project report always takes much longer than you think it will. You are advised to start well in advance of the submission date and to become familiar with all the essential requirements.

8.1 What is expected?

Your MSc report should be a substantial piece of work and it will be judged based on the level of demonstrated understanding and application of standard techniques to a new set of circumstances. Some of the techniques required to address a particular research topic may not have been covered in the lectures and practicals. In this case, you will be expected to familiarise yourself with new methodologies if needed, and to consolidate knowledge imparted in the course. You should aspire to produce a report in the style of a journal article with **up to 9000 words**.

Plagiarism

The report should be written in your own words; copying text from other sources is not acceptable. All written material will be uploaded onto the plagiarism software Turnitin. The College Board is informed of all cases where plagiarism is suspected or identified via this software. In such cases the severity of the offence will be assessed, and minor offences will result in informal or formal reprimand by the Exam Board. Major offences will be reported to the Academic Registrar for investigation and may result in expulsion from the course (see Academic Misconduct Procedure).

Please refer to the Student Handbook for information on referencing and to Imperial College information on plagiarism here.

At the beginning of the course, students should have completed the plagiarism online course. Students who have not taken the online plagiarism course or who cannot recall its content are strongly advised to review it before writing their dissertation.

How to submit your research project report

You will need to submit two electronic copies of your report: one with acknowledgements of named supervisors and other individuals; and, one without the acknowledgement section. Markers will be sent the copies without the acknowledgement section, to maintain anonymity of work. The other copy containing the full acknowledgements page will be retained for full record of your work within the department. Please submit your electronic copies through the following the steps:

1. Convert your report to a portable document format (pdf).
2. Log onto Blackboard Learn.
3. Click on 'Research Project Reports' on the main menu (left hand side).
4. Click on 'HDA Research Project reports'.
5. Submit the copy with acknowledgements of named individuals through the Blackboard assignment portal.
6. Submit the copy without the acknowledgments section through the Turnitin portal.
7. Do not submit both copies to Turnitin, as: 1) a second (and subsequent) submission to the same Turnitin portal will overwrite the earlier ones; and, 2) submissions to different Turnitin portals will be picked up for similarity checks against each other and return an inaccurate high percentage.
8. The copy submitted to Turnitin will be marked anonymously by two markers. Therefore, when submitting your report, please use your CID number only as the submission title and name your file using the CID number.

NB: Submissions after the deadline will be subject to late submission rules described in your course handbook.

Submitted reports can be made available for future reference by students and wider academic community through Imperial College Libraries. The deposit of master's dissertations/research project report is managed by departments and is not mandatory (see open access guidelines for masters dissertations).

Format

Before you start to write your report, it is a good idea to look at some previous ones to see what the finished product should look like. Course Organisers will provide some exemplars. The report should be typed in 11-12pt in an acceptable font (Times New Roman, Garamond, or Arial), with lines 1.5 spaced and with margins ideally 2.0cm at the top, bottom and sides. Each major section (Introduction, Methods etc.) should be well indicated. Paragraphs should be made clearly visible either by indenting the first line (by 5 spaces) or by leaving an additional blank line between paragraphs. The British spelling is preferred.

Length

The report length should be **up to 9,000 words** for the main text (excluding tables and figures in the main text). If the report word count falls outside the upper word limit, markers will not read any additional text.

What is included in the word count?

- Headings of sections
- Main text
- Citations in the body of the text
- Footnotes

What is excluded from the word count?

- Title page
- Lists of contents/tables/figures/abbreviations/references
- Abstract

- Acknowledgements
- Tables and figures, and their captions
- References
- Appendices

8.2 Structure

The report should be broadly divided into the following sections:

- Title/Cover Page
- Summary/abstract – this should be no longer than 250 words and it should contain the following sections: Background; Aims/Objectives; Methods; Results; and Conclusions.
- Background and literature review
- Methods
- Results
- Discussion (including limitations and future work)
- Conclusions
- Acknowledgements (individual's names should be omitted in the copy to be submitted via Turnitin for marking)
- References
- Appendices

There are two title/cover pages that you should use, one for the assessed copy and another for the record keeping copy. Please see details below for what each should contain.

Title /cover page (for assessed copy submitted to Turnitin)

You should use the cover page template for written assignments, which is provided on Blackboard, also available in LaTeX here, and contains:

- The College logo
- The title of your dissertation
- Your CID (do not print your name or the name of your supervisor on the dissertation)
- Degree for which the dissertation is being submitted
- Date of submission
- Word count

Title /cover page (for copy submitted for record keeping)

You should use the cover page template for written assignments, which is provided on Blackboard, also available in LaTeX here, and contains:

- The College logo
- The title of your dissertation
- Your Full name and CID Number
- Degree for which the dissertation is being submitted
- Date of submission
- Word count

Acknowledgements

As in any piece of published research work, it is important to be transparent about any inputs into the work, including any conflicts of interest and external support. This section should include academic acknowledgements (and non-academic- personal - acknowledgements if you wish). Remember to remove project supervisor's name and that of any other external collaborators from the copies submitted via Turnitin for assessment - do not provide any information that would compromise your anonymity.

To reiterate, students are therefore asked to prepare 2 drafts of the report:

1. without names - for marking (this copy will primarily be used for marking purposes, maintaining anonymity of students)

2. with your name on title page and names inserted in the Acknowledgements etc - for record keeping and dissemination, as necessary. The academic acknowledgements need to state what part of the work has been carried out entirely by you, and what work has had some input from others (e.g. data collection, any help with statistical analyses etc.). You should also state how much support you have received from your supervisor, the number and type of meetings you've had, the number of drafts that have been reviewed, and any other information that's relevant to disclose.

Abstract

This should give a brief and clear summary of the purpose of your study, the methods and techniques that you chose to use, the major findings and a discussion of the technical aspects and academic significance of these results. Abstracts should be no longer than 250 words.

Introduction

This should provide the background literature to the study, together with a discussion of the specific work, published and unpublished, that motivated your own project. A final paragraph should introduce the specific aims and objectives of your research work. It is important that you can undertake a thorough review of the available literature on your chosen topic. This is the first stage of your exploration and constitutes the foundation of your project. The review has at least three purposes. It can be used to:

- Outline current theories and concepts (useful for generating topics and research questions)

- Provide results and data from previous studies (helpful in providing background to the research)

- Provide examples of successful and unsuccessful research designs, approaches, methods, techniques, and research instruments.

Methods

This section should describe and explain the statistical, mathematical techniques used in achieving the objectives of the study. This section should give sufficient detail such that someone else could reproduce the results. The methods section is used to justify the choice of methods and to demonstrate your understanding of the limitations of the methods you have used. If you are carrying out analyses of secondary data you will need to make this clear and to give some information on when, how, and why the primary data were collected. The suggested word count for this section is 1,000 – 1,500 words.

Results

The exact way you present your data will depend upon the nature of the data. However, the following general rules apply to all studies. All essential data should be concisely described in the text. Details should be presented as figures (e.g. histograms, scatter-plots etc.) and tables. Figures and tables should each be titled and numbered (e.g. Fig. 1, Fig. 2 etc., Table 1, and Table 2, etc.) and should be referred to in the appropriate section in the text. The titles and captions should be informative and self-contained. The suggested word count for this section is 500 – 1,000 words.

Discussion

There are two aspects to a discussion: technical and academic.

For the technical part you should discuss the advantages and disadvantages of the techniques that you used. You should also discuss the problems (there are always some!) that you encountered, why you think these arose and how you tried to solve them.

For the academic part you should summarise the major findings of your research data, and then discuss your interpretation of these data and what you feel is their significance in the context of work that has been published in the literature.

Finally, you should discuss future work that could be done to answer the unanswered questions that remain at the end of your work, and the direction in which you think this research might lead.

A paragraph with concluding remarks is valuable.

The suggested word count for this section is 3,000 – 4,000 words

Referencing

- As you write your research project report you should reference any sources of information, examples, and quotes.
- Referencing style should conform to academic standards and you will need to follow formal conventions. We recommend you use either the Vancouver or the Harvard Style, depending on the type of your project, but you must be consistent in your reference style throughout the text. Most biomedical journals use the Vancouver style, while Harvard is more often used in social science. Please see this link here for current information on the choice of referencing styles you may use (from Imperial College library)
- We strongly suggest you keep track of references while you are drafting your document, as it is often challenging and time-consuming to do so later.
- We recommend you use referencing software, like Endnote, Mendeley and Papers.

Tables and Figures

A discretionary use of statistical output, tables and figures is recommended – marks will be deducted if a judicious choice of output is not demonstrated. **Output from statistical programmes should be transferred to tables or text (and not included directly)**.

- Tables and figures must be appropriately labelled and numbered (e.g. Fig. 1, Fig. 2 etc., Table 1, Table 2 etc.).
- Headings of tables should be placed above the table, and headings of figures should be placed below the figure.
- It is good practice to restrict the number of lines in the tables. Inspect good epidemiological journals (e.g. BMJ, Am J Epidemiol) for examples of how to do so.
- You must refer to every figure and table that is part of the main project from the text.

- Don't repeat all information that you present in the figure and table in the text in words. Instead, describe what the table or figure shows in the results section.
- Tips on how to choose, prepare and layout tables and figures can, for instance, be found here. You might also want to have a look at examples of poorly designed figures to better grasp what to avoid.
- Researchers are required to obtain permission and acknowledge sources in full when they use data from an external (published or unpublished) source.

Appendices

Appendices are not included in the total word count for the dissertation. Appendices are not necessarily read or marked. These should contain information that will aid the reader's understanding of the project but are not essential to the overall project. Examples: questionnaires used, search strings used in systematic reviews, literature quality appraisal tools used, maps of the region where the project was undertaken, diagrammatic illustrations of models, large tables, series of graphs and excerpts of interview transcripts etc.

8.3 Report preparation timeline

This is very important. Four months is quite short to carry out a research project and write up your work in a nicely presented format. You will be working **full-time** on your project and the following timetable has been designed to help you plan your time efficiently and effectively. Below you have a suggested timeline for the completion of your project. Please note this is a guideline and not prescriptive, as every project is different.

March/April: Once your project has been allocated start some background reading on the topic.

May: Begin project (organise data as you get it), continue background reading and draft literature review.

June: Continue project and complete draft of Introduction and Literature Review.

End of June: Continue project, submit draft of Introduction and Literature Review to your supervisor.

July: Finalise project and write draft Methods, and Results sections. Submit to supervisor. Discuss Introduction/Methods with supervisor.

1st week in August: Write draft Discussion and submit to supervisor by 5th August. Discuss Results and Discussion sections with supervisor.

2nd week in August: Do all corrections to the report.

Remaining time: Complete the report, including reference list and all tables and figures. Write figure legends. Prepare table of contents. Edit, proof read, edit, and proof read again!!

9 Deadline

August

On or preferably before 1.00pm on Monday 28th August 2023 - Submit your research project report on Blackboard, by 1:00pm at the absolute latest. The online submission will be closed after 1.00pm and it will be impossible to submit.

It is essential that your report is submitted by 1.00 p.m. on this day. IF YOU SUBMIT LATE, YOUR MARK WILL BE CAPPED (if submitted within 24 hours of the deadline), OR YOUR MAY BE AWARDED A MARK OF ZERO (if submitted more than 24 hours after the deadline) unless there are mitigating circumstances that are valid and could not have been avoided. For more details about late submissions, mitigating circumstances and extension requests, refer to your course handbook. If you suspect that you may not be able to complete on time because of circumstances outside your control, please contact the Course Administrator or Course Organiser in good time!

September

Your oral examination (presentation) will be held during the second/third week of September. You should use your time between submission and presentation / examination to read your report and read around the relevant areas in preparation of your viva voce examination. Also, prepare for your viva by discussing possible questions with your personal tutor,

supervisor, or appropriate research group in order to obtain enough practice and feedback before the day. Please see the next section for further details on the oral presentation.

During this period, you will also have the opportunity to provide feedback about the course to the External Examiner and/or Course Director and/or Chair of the Board of Examiners to be included in his/her report.

10 Oral presentation/Viva

All students will be required to give an oral presentation on their research project. The presentation should be presented in a relevant format which can include, for example, Powerpoint presentation slides, Beamer slides or Rmarkdown slides.

Submission instructions for the presentation slides will be announced by the Education Team closer to the date.

Timing

- 15 minutes to deliver the presentation; and,
- 5 minutes for audience questions and your answers.

What happens if you run over time?

Please keep to time – running over may affect your mark. The assessors will be timing your presentation and will let you know when you have 1 minute remaining. If you run overtime, this affects your mark as it occupies the time dedicated to questions. You want to make sure that you have enough time for questions to demonstrate your knowledge of the project and methods used.

Marking Criteria

Your presentation will make up 20% of your overall research project mark. The marking criteria and points allocation can be found in the Appendix, which you should use as a guide for developing your slides. For example, your presentation should provide a very

brief background on the topic, leading to your specific research aims, followed by details of the methods used and an overview of your key findings, with some discussion around your findings and a take home message/conclusion.

Uploading Presentation

Please upload your presentation onto Blackboard under your allocated presentation group by the allocated time slot given by the Education team (exact presentation date in week beginning 5 September 2023 to be confirmed).

11 Dissertation marking

The Research Project module forms one-third of the final weighted MSc grade(30 ECTs). A copy of the marking scheme is provided in the Appendix. The examiners will look principally at:

- The rationale for the project and literature review;
- Understanding and application of the methods selected;
- The analysis and critical interpretation of data/findings;
- Restraint in the selection of visualisations and results presentation; and,
- Suggestions for future work.

12 Prize for best research project

Every year, a prize is awarded for the best Master's research project in the course. The prize is worth £100. All research projects with distinction level marks will be considered by the Chair of the Examination Board and the External Examiner. Results will be communicated after the final exam board.

13 Common problems and pitfalls

You will probably be aware of your own strengths and weaknesses. For example, you may be an organised person in your working life but prone to being too ambitious. Or you may be very good at listening to people, but not the most punctual person. It is important that you take these strengths and weaknesses into account when you are producing your research timetable. This may mean leaving more time for writing, discussing and editing the report so you are sure to make the final deadline.

There are some common problems and pitfalls that are encountered by students (and by professional researchers). These are:

- Not having a sufficiently focused or feasible research question.
- Not getting access to research data in good time.
- Having too much data to analyse.
- Not leaving enough time for writing and editing.
- Not getting feedback on the written report from their supervisors.
- Not taking the initiative and owning the project.

Can you think of some others that might affect you?

14 A final note from the HDA team

The research project is one of the most exciting experiences of the MSc in Health Data Analytics and Machine Learning. It is a very special period of the course where you can focus solely on research. Most researchers look back on their master's project period very fondly and many use it as a stepping stone into their careers as researchers, be it in academia or in the industry. So, focus, ask questions, immerse yourself in your research and make the most of it.

The HDA-ML course team wishes you all the best in this period and please reach out if you have any concerns or just want to discuss your ideas/research.

Good luck!

Appendix A

Research report marking guide

Research Report Marking Guide

Guide for awarding your mark			Marker's comments for student feedback:	Your mark
Abstract: Is the abstract clear, focused, concise and stand alone to the report?	**Poor** Poorly written, incomplete, lacks clarity and focus	0-2		**/5**
	Adequate-good Well written, concise, clear and focussed abstract.	3		
	Excellent- outstanding An exceptionally well written abstract which provides a clear overview of the report acceptable for academic conferences.	4-5		
Project aims: Are the aims /research questions/hypotheses defined clearly and understood in the light of related literature?	**Poor** Incomplete statement of aims	0-2		**/5**
	Adequate - good Aims are clear but may be thinly described or justification for the study could be stronger and better supported	3		
	Excellent - outstanding A highly developed set of aims /research questions. The importance and implications of the study have been sharply defined and supported.	4-5		
Background / context: Has the student consulted, read and understood the related literature? Is the literature appropriately cited and referenced? Has previous research been critiqued?	**Poor** The review is too scanty or irrelevant. There is inadequate referencing of the works of others.	0-8		**/20**
	Adequate Previous research has been reviewed and is correctly referenced on the whole but review may lack depth/critique.	9-11		
	Good-Very good Well-written and constructed, relevant review but may lack sophisticated understanding and critique.	12-14		
	Excellent - outstanding Thorough review, impressive level of understanding and critique. Could have been written by a leader in the field.	15-20		
Methodology: Is the analytical plan sound and justified? Are the methods well described? Have the models been formulated correctly?	**Poor** Major problems with the selection or description of one or more of the key elements	0 - 8		**/20**
	Adequate Key elements are described to sufficient level to understand the methods and measured used. Methods reflect sound scientific practice.	9-11		
	Good All key elements are described in sufficient detail. Methods reflect some attention to detail and scientific rigour with a few lapses.	12-14		

	Excellent - outstanding All key elements described in detail Methods reflect cutting-edge research, impressive level of research ability and skill.	15-20		
Presentation of results Has there been judicious choice as to which equations, tables, figures to present? Are legends clear and informative? Sensitivity to model parameters?	**Poor** Major problems with the presentation of the results.	0- 4		**/10**
	Adequate Results presented are internally consistent but there are some problems.	5		
	Good – very good Results are clearly presented, appear accurate and are informative.	6-7		
	Excellent – outstanding Difficult to fault the choice and presentation of results; publication standard.	8-10		
Critical interpretation of results and methods appraisal Has the student demonstrated a critical understanding of the results, their implications/validity? Has methods employed successfully fulfilled the original study aim? Have the results been discussed in the light of the original aims? Are the methods used	**Poor** Major problems with interpretation	0-8		**/20**
	Adequate Enough accurate & critical interpretation is provided	9-11		
	Good – very good Accurate, thorough and critical interpretation.	12-14		
	Excellent – outstanding Interpretation is impressive; shows originality, insight and balance.	15-20		
Appropriateness of the discussion: Has student appreciated the limitations of the data/methods and discussed the subsequent generalisation of results and directions for further work?	**Poor** Weaknesses of the study not considered /scant or incorrect / unsupported consideration	0-5		**/10**
	Adequate Acknowledges some limitations and makes one or more appropriate recommendations. Findings are discussed to some extent in context of previous research.	6		
	Good- very good Well rounded discussion of limitations and implications of the study for further research; discusses in context of relevant research. Perhaps lacks some creativity and or depth.	6-7		
	Excellent – outstanding The discussion represents some of the most sophisticated thinking in the field.	8-10		
Quality of the overall presentation of the work and clarity of argument Is the study of sufficient scope for an MSc research project? Is the report a well-organised, well-presented, high quality document	**Poor** Deficient, disorganised, poorly communicated and/or irrelevant work	0-4		
	Adequate Demonstrates sufficient understanding of the research topic and research process	5		

demonstrating a suitable level of critical ability?	but there are flaws in the execution or communication of the study.			**/10**
	Good – very good Good grasp of the research issue and process, sound method and critical interpretation. Some creativity. Possibly of publishable quality with some extra work.	6-7		
	Excellent – outstanding Stylish, impressive, cutting edge report that most masters candidates would not be expected to fulfil. Difficult to fault. Publishable. Could have been written by a leader in the field	8-10		
Total Marks				**/100**

Appendix B

Master's research project presentation mark sheet

Master's research project presentation mark sheet

Student:

Project Title:

Criteria	Total Marks		Assessment	Mark Range
1- Overall quality of the presentation: clarity of the work and of the argumentation	15		Needs attention	0-7.49
			Adequate	7.5-9.99
			Good	10-11.99
			Excellent	12-15
2- Description of the data and research question: appreciation of the background / context of the study.	10		Needs attention	0-4.99
			Adequate	5-6.99
			Good	7-8.49
			Excellent	8.5-10
3- Description of the model used: clear formulation of the models, their underlying hypotheses and their parametrisations. Justification of the hypotheses.	15		Needs attention	0-7.49
			Adequate	7.5-9.99
			Good	10-11.99
			Excellent	12-15
4- Quality of the results: validity of the results, quality/clarity of their presentation	15		Needs attention	0-7.49
			Adequate	7.5-9.99
			Good	10-11.99
			Excellent	12-15
5- The appropriateness of the interpretation and conclusions: evaluation of the quality of the results and the methods used and their meaning	20		Needs attention	0-9.99
			Adequate	10-13.99
			Good	14-15.99
			Excellent	16-20
6- Ability to justify their work and/or acknowledge, explain possible limitations of the data/analyses and propose alternatives/perspectives and answer panel's questions	25		Needs attention	0-12.49
			Adequate	12.5-14.99
			Good	15-19.99
			Excellent	20-25
Total	**100**		Fail	0-49
			Pass	50-59
			Merit	60-69
			Distinction	70-79
			Outstanding Distinction	80-100

Please give both positive and negative feedback below:

Marker's Name..... Marker's Signature.....

Appendix C

Description of grade bands

Descriptions of grade bands

Descriptions of Grade Bands	Mark
FAIL/Poor Too confused, irrelevant, methodologically too poor or too brief (30-39%). Completely disorganised, irrelevant and methodologically unsound or lacks key components of the research process (10-29%) The report does not demonstrate any aspect of a research project (below 10%).	0 - 39
FAIL/Deficient The report *could* be satisfactory but the study has been communicated too poorly or candidate shows confused understanding of the research issue or method.	40 - 49
PASS (lower)/Adequate The report is adequate. It is sufficient for a Master's research project report but there are some problems with research topic, method, interpretation and/or communication.	50 - 55
PASS (upper)Satisfactory Satisfactory report. Candidate demonstrates understanding of the research topic and research process but did not carry out the study very well or has difficulty communicating the study well in writing or the study has some weaknesses.	56 - 59
MERIT (lower)/Good Good grasp of the research issue and process, sound method and adequate critical interpretation of data/method. Well-written and organised on the whole but there are some concerns about the quality of the work in places.	60 - 65
MERIT (higher)/Very good Very good grasp of the research issue and process, sound method and appropriate critical interpretation of method/data but falls short of excellence. Possibly of publishable quality with some additional work.	66 - 69
DISTINCTION/Generally excellent Shows all the required qualities at distinction level but falls below a consistent level of excellence in one or two areas. The report is written and organised extremely well. It is possibly of publishable quality.	70 - 79
DISTINCTION/Excellent throughout Shows impressive level of understanding, research ability & skill that most Masters candidates would not be expected to fulfill. Interpretation of findings shows originality, insight & balance. Written with mature writing style. It is of publishable quality.	80 - 89
DISTINCTION/Outstanding Could have been written by a leader in the field. Difficult to fault any aspect. Outstanding, cutting-edge report. Stylish, extremely well balanced, excellent critique throughout; it is certainly of publishable quality.	90 -100

Appendix D

Special fund for essential project costs

Special fund for essential project costs

There is a small fund to support summer project costs in certain cases.

Project supervisors may apply. Applications can be considered if:

a) the unmet costs will prohibit the completion of the project and
b) there are no alternative funds to support the costs.

Proposals will be judged competitively in terms of merit.

The maximum request is £500.

Please send completed applications, no more than one side A4, to:

Jo Tite, Postgraduate Programmes Coordinator
j.tite@imperial.ac.uk
by 28th April 2023