UNIVERSITY OF CAMBRIDGE

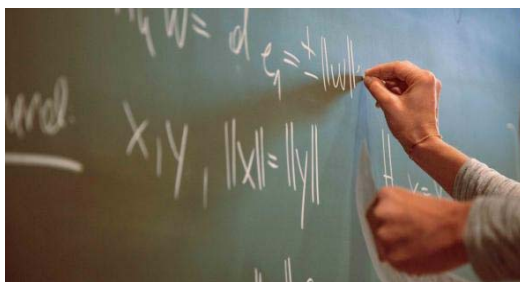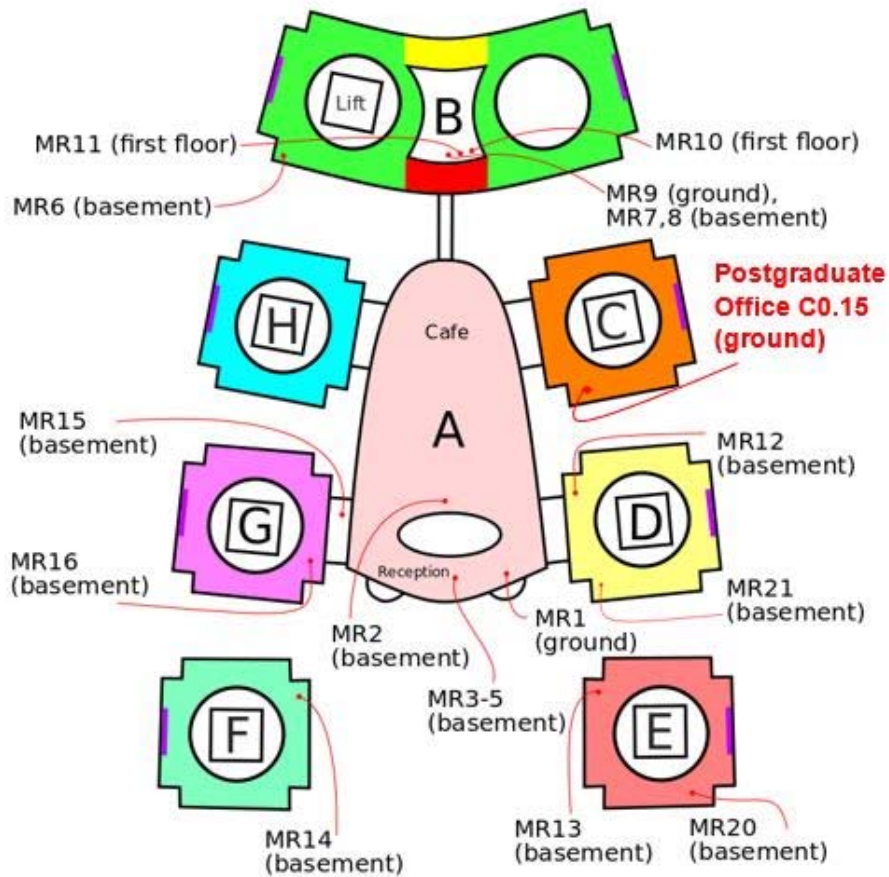# Cambridge Mathematics of Information

Handbook

October 2020

Centre for Mathematical Sciences

Wilberforce Road, Cambridge

MR11 (first floor)

MR6 (basement)

MR10 (first floor)

MR9 (ground), MR7,8 (basement)

Postgraduate Office C0.15 (ground)

MR15 (basement)

MR16 (basement)

MR12 (basement)

MR21 (basement)

MR2 (basement)

MR1 (ground)

MR3-5 (basement)

MR14 (basement)

MR13 (basement)

MR20 (basement)

Cafe

Reception

Isaac Newton Institute

Access to MR1-5, MR13-16 is via reception in Pavilion A; disabled access is via lift in Pavilion D.

All pavilions except A have one lift each, marked above with squares.

Betty & Gordon Moore Library

Gatehouse

Contents

Welcome to CMI

We take pleasure in welcoming you as a PhD student in Cambridge Mathematics of Information.

This Handbook contains useful information about your course but is not exhaustive. If there is anything you want to know, do ask one of us, or the CMI Secretary, Tessa Blackman cmi@maths.cam.ac.uk.

Things will be a little different this year due to the ongoing pandemic. Many of the activities that make the CMS so vibrant have had to move online (lectures, training activities, seminars). However, we will endeavour to ensure you feel supported and integrated into the Faculty.

We draw your attention particularly to the CMS Health and Safety policy http://www.cms.cam.ac.uk/safety/safetypolicy and to the Appendix on the Code of Conduct for Research Students.

We suggest that you plan to arrive in Cambridge the weekend before the beginning of term. On arrival at the Centre for Mathematical Sciences, ask at Reception for Tessa Blackman in the Postgraduate Office. We also suggest that you make contact with your First Year Supervisor prior to your arrival. Lecture courses begin on Thursday 8 October.

The First Year Briefing is on **Wednesday 7 October at 11.30am**. We look forward to seeing you then.

Richard Nickl
Carola-Bibiane Schönlieb

2. CMS and COVID

The CMS has a detailed protocol describing access to the building and ways of working during the current pandemic. You can always access the latest copy of the protocol here:

https://www.maths.cam.ac.uk/internal/versioned_file/covid19/return-to-cms/current

The key messages are:

1. The default position is that people should continue to work from their residence if at all possible. However, it is appreciated that this is not always possible. Valid reasons for coming into the CMS include (for example): access to documents/printers, access to lecture theatres to record lectures, access to stable internet to give lectures/example classes/seminars/supervisions, wellbeing issues, etc.

2. All staff/students on site MUST use the online monitoring tool provided when entering and exiting the CMS https://register.maths.cam.ac.uk/.

3. Occupancy for ALL offices at the CMS is normally limited to one person at a time. You will have to agree a rota for access to the office with your office mates in advance. This may mean you are only in the CMS 1-2 days per week. If you feel you need to spend more time in the CMS and cannot agree this with your office mates then contact Tessa who will try to offer alternative office space where possible. Working in the CMS at weekends or in the evenings is currently discouraged (though you may, of course, come in if you wish).

4. Occasional, reasonable length 2 person RESEARCH meetings with 1m+ protocols (wearing face coverings, no sharing of writing implements etc.) is permissible once per day in an office. e.g. a PhD supervisor can meet one student in the supervisor's (or student's) office

5. The RULE OF SIX applies at all times when on site (both inside and outside the buildings). This means social meetings (i.e. not for work or education purposes, e.g. for lunch) are limited to a MAXIMUM of 6 people even if social distancing is followed.

6. Masks should be worn at ALL times within the CMS unless you are alone in your office, or following the specific Standard Operating Procedure associated with your experimental activity in the GKB Laboratory.

7. Hand sanitiser is available throughout the Departments at each entrance and in each office, common room, meeting room and bathroom.

8. There is a one-way system in Central Core, in and out of C, D, G & H common rooms and some of the larger lecture rooms (MRs 2, 3 & 9). Corridors have sufficient passing spaces already and those going down staircases will have right of way.

Wellbeing

Looking after your wellbeing is particularly important at the moment. There are lots of sources of support within the Faculty and across the University. Please see the student wellbeing pages for more information, including looking after your mental health.
https://www.studentwellbeing.admin.cam.ac.uk/support-particular-issues/coronavirus-covid-19.

3. Supervision

The role of your Supervisor is set out in the University's `Code of Practice for Research Students', which applies to CMI. See also the Appendix. This section describes some CMI-specific aspects of your supervision arrangements.

3.1 First Year Supervision

On admission to CMI each student is assigned a First Year Supervisor from the Faculty of Mathematics. Your First Year Supervisor will set you an Initial Research Project, which will run throughout the first year and which will lead to a report (around 30 pages) and presentation at the end of Easter Term. They will also direct your studies, including advising on any course choices, and will report to the University and to the CMI Co-Directors on your progress. Your Supervisor may also recommend your attendance at particular research seminars or study groups relevant to your Project. You should make contact with your Supervisor to arrange an initial meeting, ideally before the start of lectures in Michaelmas Term.

It is intended that CMI students can use their first year to explore several options for PhD study. If you are keen to do this, you should discuss it with your First Year Supervisor in your initial meeting. They may then be able to adapt your Initial Research Project and choice of Supplementary Courses to give you a broader experience of research in your first year. For some students, the External Project offers a further route towards PhD supervision in another Department of the University or in industry. Or, you may wish to press on in your chosen research area, in which case your Initial Research Project will reflect this.

If, as the first year progresses, your preferred research area moves away from your First Year Supervisor, then it is your responsibility to approach other potential supervisors. The CMI Co-Directors are available for consultation.

3.2 Continuation or Change of Supervisor after First Year

In most cases, your First Year Supervisor will have recommended your admission to CMI. You can expect that, provided your work in the first year is satisfactory, they will be willing to act as your PhD Supervisor. While, in many cases, students will continue with their First Year Supervisor for the PhD, it is equally acceptable to move to a new PhD Supervisor, and indeed this is an intended flexibility in CMI, allowing you to choose the area for your PhD thesis on the basis of your experience in the first year. Students who wish to change supervisor should ask potential supervisors about their likely availability early, since all supervisors have a limited capacity and some may not be able to take new students in a given year.

At the end of your third term, following the First Year Review and Registration for the PhD, you will be assigned a PhD Supervisor. Your PhD Supervisor may be from the Faculty of Mathematics, or another Department of the University, or from a CMI Industrial Partner. If your PhD Supervisor is from another Department, you will be assigned a Second Supervisor from the Faculty of Mathematics. If your PhD Supervisor is from industry, you will be assigned a University Supervisor from the Faculty of Mathematics.

Your Supervisor will report termly to the University and to the CMI Co-Directors on your progress.

3.3 Research Diary

Your Supervisor may require you to maintain a Research Diary, as a record of objectives and outcomes in your research. This is regarded as good practice in CMI and may conveniently be combined with keeping a Training Log, as required for your First and Second Year Reviews.

3.4 Advisors

The University requires that you have also an Advisor, who is an alternative point of contact to your Supervisor. Your Advisor will initially be one of the CMI Co-Directors. Depending on the subject of your PhD, you may wish to request a change of Advisor at a later stage to someone whose research area is closer to your own.

4. First Year Programme

The First Year Programme at CMI 2020/21 comprises the following components

- Initial Research Project
- Either
    - External Research Project or
    - Two Supplementary Part III Courses
- CMI Core Courses
    - Mathematics of Information
    - Partial Differential Equations / Probability
    - Applied and Computational Analysis
- Industry Seminars
- CCIMI seminars and one day conferences
- Introduction to research computing collaboration session
- First Year Review

The programme concludes with the first year reviews. It is intensive and demanding. Teamwork within the first year cohort is an intrinsic aspect. You are asked to agree any periods of absences, which should be during University vacations, with your supervisor.

First Year CMI students are also expected to attend "Coffee" where we rely on your attendance to communicate information about upcoming events. (Details to be confirmed at the induction)

4.1 Initial Research Project

You will work throughout the year under the direction of your First Year Supervisor on an Initial Research Project. The form and the content of this will be determined by your Supervisor. Work on the Project should amount to the equivalent of three months' solid work, but will be spread through the year, taking account of other components of the Programme. This Project will be assessed through a (latexed) report by you of about 30 pages to be submitted by 2 June, by a report from your Supervisor, and through a presentation by you on 7 or 8 June, of 30 minutes duration to the first year CMI cohort. A student will act as `rapporteur' on your presentation. The Directors can also provide feedback if required.

4.2 External Research Project (optional)

The External Project, if chosen, is undertaken in Michaelmas and Lent term. A booklet of Project descriptions will be available at the beginning of November. Each Project will come from a CMI partner organisation, either in industry or in another University department. You will have a supervisor in the partner organisation for the duration of the Project who will provide a short report on the outcome. There may be an internal contact from the Faculty of Mathematics who will also be available for initial discussion as you explore which Project to do.

Usually each single Project will only be available to a single student.

You will need to send project preferences to the CMI Secretary cmi@maths.cam.ac.uk by 20 November. You should have initiated the Project by meeting your external supervisor by 4 December. Your work on the Project should be equivalent to about one month's solid work (i.e. about 160 hours in total). You will write a report of around 10 pages on the Project, which must be submitted to cmi@maths.cam.ac.uk by 19 March and you will be required to give a 20 minute presentation on the Project to the cohort w/c 22 March. A second year CMI student will act as `rapporteur' on your presentation.

4.3 Supplementary Part III Courses (optional)

If you do not undertake an External Project you must offer, for oral examination (of approximately one hour), two courses from Part III. You should discuss and agree your choice of Supplementary Part III Courses for oral examination with your First Year Supervisor, who will advise whether you should take any of the priority courses and will guide your choice of any further courses. Please inform the CMI Secretary CMI@maths.cam.ac.uk of your choices by 13 November.

4.4 CMI Core Courses

There are three Core Courses in 2020/21, to be taken by all students. They each follow a similar pattern of reading assignments and projects done in student teams, leading to write-ups and presentations to the whole cohort. A Subject Coordinator takes overall responsibility for the Course, which will involve also supervision by other teaching officers and post-docs.

Mathematics of Information (R. Nickl and C. Schoenlieb, Michaelmas and Lent Term)

The course comprises eight two hour meetings throughout Michaelmas and Lent (four meetings each term), in reading group format, where students prepare presentations to everyone on selected papers across the spectrum of maths of information.

- 13 October 1-2pm: Briefing meeting
- 2, 9, 16, 23, 30 November afternoons: Presentation meetings

Probability and Partial Differential Equations (J. Norris and J. Miller, Michaelmas Term)

Students are expected to attend or otherwise be familiar with the content of the Part III course Advanced Probability, which runs in Michaelmas Term

- 14 October 3.30-4.30pm: Briefing meeting
- Project presentations: 27-28 November 2020

Applied and Computational Analysis (C. Schoenlieb, Lent Term)
- Briefing meeting and presentations will take place in Lent term. Exact dates TBC.

The Subject Coordinators may offer feedback on the assignment write-ups and presentations, including the success of team-working, to be considered in the First Year Reviews.

4.5 Industry Seminars

DAMTP and DPMMS run a joint programme of Industry Seminars, some of which are given by CMI Industry Partners. You are strongly encouraged to attend and will be expected to state which Industry Seminars you have attended in your Training Log.

4.6 CCIMI Seminars and Conferences

CCIMI seminars are run regularly throughout the year and cover a variety of topics. In addition, a series of short course are arranged on subjects of particular interest to CCIMI members. If there is a particular topic or speaker that is of interest you can suggest speakers to invite.

The CCIMI runs two conferences annually, which CMI students should attend and are encouraged to actively participate . In normal years this is typically held at the Isaac Newton Institute,

4.7 Introduction to Research Computing Course

During Michaelmas term the department runs an optional Introduction to Research Computing Course but you are encouraged to attend if would like to refresh these skills. Alongside this course, a mandatory session is delivered by Cantab Capital Partners and looks at collaborative coding and code sharing through practical examples. This session will take place in late November (date TBC) and you will be expected to attend. Further information will be circulated with final details.

4.8 First Year Review

You will have a First Year Review with the Co-Directors of CMI on 17 or 18 June. The Co-Directors will consider

- reports from your First Year Supervisor on your Initial Research Project and from the supervisor of your External Project
- reports from Subject Coordinators on the First Year Core Courses
- reports of your oral examinations on two Part III courses.
- your Training Log.

You should submit your Training Log and a statement on what has been agreed regarding your PhD supervision to CMI@maths.cam.ac.uk by 14 June. The training log should be a short factual statement prepared by you of your training and research activities since admission.

If all aspects of your progress are satisfactory, the Co-Directors will recommend your Registration as a PhD student, and will arrange, where necessary, your transfer to your PhD Supervisor. Please see the Appendix for cases where progress is unsatisfactory.

5. Years Two to Four

As CMI students, you have a unique opportunity through your broad education in Analysis and the network of the CMI cohorts to bring ideas from one area of Analysis into another, and into applications. We strongly approve of collaborative research spanning different branches of Analysis, involving CMI students with different areas of expertise.

You are expected to work under the direction of your PhD supervisor. In particular, you should discuss with your supervisor expectations concerning place of work and periods of absence. While your main focus should be on working towards your PhD, you are expected to take advantage of and contribute to wider CMI activities.

CMI-specific activities in years two to four include:

- Mentoring of CMI first year students (by second years)
- Cambridge Analysts Knowledge Exchange (CAKE) Seminar -- a postgraduate student seminar run by CCA/CMI second years
- Student-run reading groups
- Industry seminars
- Occasional CCIMI-sponsored Short Courses
- A Careers Briefing for third year students in Easter Term run by the co-Directors.
- CCIMI Research jam – students and researchers give 5 minute 'flash' talks
- CCIMI video contest

There are further training opportunities, run by DPMMS, DAMTP and others, which you are also encouraged to take up as appropriate, including:

- training for undergraduate supervisors
- Smith / Knight / Rayleigh Prize Essay competition
- training in public engagement and outreach.

Second Year CMI students have a Second Year Review with their PhD Supervisor and a CMI Co-Director in June. For this you will need to send to CMI@maths.cam.ac.uk before the Review

- your Training Log, covering the period since your First Year Review
- copies of research papers completed while a CMI student and / or work in progress.

The purpose of the Review is to reflect on your progress in your first full year of research. The process used specifically to address unsatisfactory progress follows the University's code of conduct.

6. Conference Travel and Research Visits

CMI students are encouraged to participate in Conferences, Workshops and Research Schools, where these are relevant to their intended research projects. On the recommendation of your Supervisor, funds are available from CMI to meet expenses. You expected to use economical modes of travel and to seek alternative sources of financial support where available. You must apply and secure approval for CMI support in advance, using the application form available at https://www.maths.cam.ac.uk/postgrad/cca/files/pre-travel-app.form_resarchstudents.pdf. Expenses can only be reimbursed against receipts, which you should submit with the completed claim form https://www.maths.cam.ac.uk/postgrad/files/researchstudexpensesform.pdf. Completed forms applying to spend funds or expenses forms for reclaiming costs can be submitted to Tessa in the Postgraduate Office. The University provides free travel insurance for academic travel, which you can apply for online via https://universityofcambridge.chubbinstanda.com/Public/Index. A rough guide is that £750 per year may be available to each student, which can be carried forward if unspent in any given year. Longer research visits may be recommended by your supervisor towards the end of your course, so you should consider keeping funds in reserve for this. Please note trips of fourteen days or more (excluding holidays) require a Work Away application with Risk Assessment. Further information is available online http://www.maths.cam.ac.uk/postgrad/current/information-current-phd-students/time-away-department.

7. Important Dates

Please make sure you are available on all dates. Submissions are done by email. These dates are also listed on the Google Calendar.

Date	Time	Event	Location
Wednesday 7 October	11.30am – 12.30pm	CMI Briefing	Online
Tuesday 13 October	1-2pm	Maths of Information core course briefing	Online
Wednesday 14 October	3.30-4.30pm	Probability and PDEs core course briefing	Online
Monday 2 November	Afternoon	Maths of Information core course presentations	Online
Monday 9 November	Afternoon	Maths of Information core course presentations	Online
Monday 16 November	Afternoon	Maths of Information core course presentations	Online
Friday 20 November	N/a	External Project preferences / confirmation of Part III courses deadline	N/a
Monday 23 November	Afternoon	Maths of Information core course presentations	Online
Monday 30 November	Afternoon	Maths of Information core course presentations	Online
Friday 19 March	N/a	External project written work submission deadline	N/a
Monday 22 March		External project presentations	Online
Wednesday 2 June	N/a	Initial Research Project written work submission deadline	N/a
Monday 7 – Tuesday 8 June	TBC	Initial Research Project presentations	Online
Monday 14 June	N/a	Research Development Log and supervision info submission deadline	N/a
Thursday 17 – Friday 18 June	TBC	End of year reviews	Online

Appendix: Code of Practice for Research Students

CMI follows the University of Cambridge Code of Practice for Research Students, available online at
http://www.admin.cam.ac.uk/students/studentregistry/current/graduate/policy/quality/cop. This Appendix sets out details of the implementation of the Code of Practice specific to CMI. It should be read in conjunction with the Code of Practice.

As a CMI student, you are either a member of the Department of Applied Mathematics and Theoretical Physics (DAMTP) or of the Department of Pure Mathematics and Mathematical Statistics (DPMMS). The two Departments together form the Faculty of Mathematics. The Director of Postgraduate Education for your Department has delegated responsibility for the oversight of your course to the Co-Directors of CMI.

On admission to CMI, you are assigned either to DAMTP or to DPMMS, and to a First Year Supervisor in the same Department. The course is identical for students assigned to DAMTP and DPMMS. At the end of the First Year, you are assigned a PhD Supervisor, who may or may not the same person as your First Year Supervisor. If your PhD Supervisor is from the other Department, you normally also change Department. If your Supervisor is from another Faculty or from industry, you also have a Second Supervisor or University Supervisor, either from DAMTP or DPMMS, and you are a member of that Department. Your First Year and PhD Supervisors are responsible for setting the scientific direction of your studies and for advising you on academic good practice and presentation of your work. In the first and second years, the normal expectation is that you meet your Supervisor at least once per week and that your Supervisor gives you regular feedback based on the progress of your work. The nature of the meetings will vary, from a brief report by you that work is proceeding as planned, to longer sessions of agenda setting and reviews of what you have achieved. After that, you meet your Supervisor as often as needed for good progress.

In the event that your Supervisor finds your work or progress to be unsatisfactory at any stage, he or she would in the first instance warn you, at the same time notifying the CMI Co-Directors. If the problem persists, your Supervisor would follow the process described in the University Code of Conduct.

You are also assigned an Advisor. Initially, this is the CMI Co-Director from your Department, unless that person is your First Year Supervisor, in which case it is be the other Co-Director. At a later stage, you may switch Advisor to someone closer to your subject area. For the sake of proper expertise, your Advisor may in some cases also be the Internal Examiner for your PhD -- to avoid possible conflict of interest, you should not normally conduct joint research with your Advisor.

Article 49 in the University Code of Practice applies to you with the following modification. You are expected to complete the research for your degree within four year of admission and to submit your dissertation also within four years.

There is no qualification resulting from the CMI First Year.

The form of the progress examination leading to registration for the PhD at the end of the First Year is specific to CMI. You have a First Year Review with the Co-Directors of CMI at the end of the third term. The Co-Directors consider

- reports from your First Year Supervisor on your Initial Research Project and from the supervisor of your External Project
- reports from Subject Coordinators on the First Year Core Courses
- reports of your oral examinations on two Part III courses

- your Training Log.

In the event that progress in any aspect is unsatisfactory, the grounds for this would be explained, Registration and assignment of your PhD supervisor would be deferred, and a remedial target would be set to be achieved by the beginning of the fourth term. Where a further Review by the Co-Directors determined that the target had not been met, they would normally recommend to the Degree Committee that you leave the course.