The Cambridge Healthcare Data Programme

“The future of healthcare is an informatics game”

Healthcare Data: Informatics, Innovation and Commercialization

Part-time courses for professionals

Postgraduate Certificate, Diploma and Master’s Levels
Introduction

This course represents a widely held desire to develop a truly novel, innovative way to fill a skills gap in healthcare data and we are very proud of the course we have been able to develop, the interest it has received.

Naturally, we want the course to be inspiring, practically applicable, and challenging but we also sincerely hope that the networks that the course creates will provide an enduring, global community who share an ethos about the use of healthcare which will drive improvements in patient care, drug discovery, social policy, and commercial innovation.

Cambridge is a world leader in research and innovation in patient and clinical trial data. It is also probably fair to say that the opportunities presented by the abundance of healthcare data have not been fully realised, both in the sense of healthcare quality and research but also commercial activity and innovation.

This course is designed to blend a comprehensive approach to understanding data and how it can be extracted, analysed, and visualised, with learning in a systems engineering approach to change management and a business focussed approach to innovation and entrepreneurship. We are very proud of the wide partnership we have been able to build when developing the course.

Our sincere hope is that this course does not produce coders and informaticians but that it produces experts who are able to see where healthcare data sits within a wider health and social landscape and who can use data to deliver value in healthcare, research, and commercial arenas.

Please read this prospectus for more information about the programme.

Dr Ronan O’Leary
Course Director
Programme and Partners

The Cambridge Healthcare Data Programme provides award-bearing, part-time courses from the University of Cambridge. Our programme advances skills in transforming raw healthcare data into effective tools which can be deployed in research, quality improvement, or commercial arenas.

Available at Postgraduate Certificate, Diploma and Master’s levels, the courses provide training in the practical interrogation and commercialization of healthcare data for those wanting to become health informaticians.

Cambridge is a world leading centre for innovation in electronic patient and clinical trial data. This is underpinned by an extensive and vibrant community of clinicians, researchers, entrepreneurs, and commercial and public sector organisations. In response to a growing skills gap in the sector the healthcare data programme has been developed by:

- Cambridge University Hospitals, NHS Foundation Trust
- University of Cambridge School of Clinical Medicine
- Department of Engineering, University of Cambridge
- University of Cambridge Institute of Continuing Education (ICE)
- Cambridge University Health partners (CUHP)
- Cambridge Judge Business School (CJBS)

The East of England has recently been designated by NHSX as one of seven Health Data Research Hubs with a focus on Inflammatory Bowel Disease. Whilst the Lead organisation is Cambridge University Hospitals NHS Foundation Trust, the Hub is a rich collaboration of institutions and organisation from the region and nationally.

The Cambridge Biomedical Campus is unmatched within the UK, and perhaps across the world, in terms of concentration of clinical, academic, educational, technology, pharmaceutical, and biosciences organisations. It is located at the heart of the UK’s and Europe’s leading life sciences cluster. The CBC contains the University of Cambridge School of Clinical Medicine with its 12 Departments and associated Institutes, Cambridge University Hospitals, a major University Teaching Hospital with 1100 beds, and a number of directly funded research institutes.

Cambridge University Health Partners is one of six Academic Health Sciences Centres in England, recognised by the Department of Health as an internationally leading centre of excellence. The CUHP Partners are Cambridge University Hospitals NHS Foundation Trust, Cambridge and Peterborough NHS Foundation Trust, Royal Papworth Hospital NHS Trust and the University of Cambridge. By inspiring and organising collaboration, CUHP aims to ensure patients reap the benefits of the world class research, bespoke educational programmes, clinicians, and industry based on the CBC and surrounding area.

The Institute of Continuing Education (ICE), University of Cambridge: Continuing education has been part of the University’s work since the 1870s and the University remains committed to the principle of providing opportunities for learning throughout life. The Institute of Continuing Education is an academic department of the University and is the focus for this work. Students study on part-time courses which range from
weekend residential courses to full MSt degrees. Madingley Hall is the University of Cambridge’s campus dedicated to continuing education for adults. The magnificent Hall was built in the sixteenth century and acquired by the University in 1948. The Hall has been used by the Institute of Continuing Education as a venue since 1975.

The Department of Engineering is one of the few truly integrated engineering departments in the world. The research portfolio develops pinnacles of world-class excellence, which adapt and combine to address a vast array of engineering challenges. Graduate teaching brings students into the heart of the latest research and developments. Across research, teaching and graduate study, the Department of Engineering offers all its staff, students and industry partners a highly networked community for sharing and developing engineering knowledge.

Cambridge Judge Business School is in the business of transformation - of individuals, of organisations and society. The School work with students and organisations at a deep level, identifying important problems and questions, challenging and coaching people to find answers, and creating new knowledge. Bringing forward the latest thinking from academia and professional practice, they apply their combined knowledge to specific business situations to turn it into action. The School achieves excellence in the quality of their research insights and educational engagement, developing knowledge both for its own sake and to help others make a difference. This combination of the latest thinking from academia and professional practice, in turn, enables them to develop greater knowledge and better methods in order to have an impact on the world in which we live and work.

The EMBL-European Bioinformatics Institute (EMBL-EBI) is part of the European Molecular Biology Laboratory (EMBL), Europe’s flagship laboratory for the life sciences. Supported by EMBL’s 20 member states and two associate member states, its 500 members of personnel come from > 40 countries. The Institute is based at the Wellcome Genome Campus home to some of the world’s foremost institutes and organisations in genomics and computational biology.

Venues used for delivery of the programme:

Institute of Continuing Education
Madingley Hall
Madingley
Cambridge
CB23 8AQ
Website: http://www.ice.cam.ac.uk/

Cambridge Biomedical Campus
Hills Road
Cambridge CB2 0SP
Website: www.medschl.cam.ac.uk

European Molecular Biology Laboratory’s European Bioinformatics Institute [EMBL-EBI]
Wellcome Genome Campus
Hinxton Cambridge CB10 1SA

EMBL-EBI website: https://www.ebi.ac.uk/
Wellcome Genome Campus website: https://www.wellcomegenecampus.org/
Key People

The programme is led and taught by an experienced and skilled faculty team along with specially selected external lecturers and industry specialists, including:

Course Leads
- **Programme Director**: Arun Gupta
- **Course Director**: Ronan O'Leary
- **Academic Director**: Tom Monie

Unit Leads
- **Unit 1**: Sarah Morgan
- **Unit 2**: Afzal Chaudry
- **Unit 3**: Matt Castle
- **Unit 4**: John Clarkson
- **Unit 5**: Chris Coleridge

Administrative Lead
- **Head of Academic Centre Administration**: Gillian Barclay

Aims of the Cambridge Healthcare Data Programme

The programme has been designed to provide an introduction to the research skills, governance and innovation needed to work successfully with healthcare data. In addition students will be equipped with the skills necessary to understand how healthcare data relates to populations, health conditions and clinical outcomes and learn how to work with healthcare data in an effective manner.

The programmes have been developed by a network of partners with unrivalled experience in healthcare informatics to create a world-leading training environment. They will develop individuals with the necessary knowledge and skills to be able to understand and critically evaluate electronic healthcare data and its application for healthcare research.

The programme will:

- Provide professionally relevant teaching and learning of the knowledge and skills at the forefront the successful understanding and utilisation of electronic healthcare data.
- Develop healthcare data experts with the necessary expertise, and originality of application, to pursue and expand their roles in the rapidly evolving environment of healthcare data.
- Promote a comprehensive understanding of the practical and ethical considerations relevant to healthcare data and informatics.
- Ensure a systems-based approach to the critical analysis and development of improvements in healthcare systems.
- Provide work-relevant learning around the current problems, best-practice, challenges and potential solutions in the use of healthcare data.
- Create a professional network of like-minded individuals as leaders in the field of healthcare data.
- Provide students with the skills and knowledge to make value-based judgements around how to extract, refine, and structure data to permit effective healthcare research.
Programme Structure

The Healthcare Data: Informatics, Innovation, and Commercialization course is a part-time programme designed to fit with the demands of full-time employment. The course is delivered through a combination of face-to-face sessions requiring attendance in Cambridge, self-directed learning and supported through a virtual online environment [VLE].

The programme leads to the following University of Cambridge degrees or awards:

Postgraduate Certificate (PgCert) in Healthcare Data and Informatics
A one-year part-time Master’s level programme resulting in 60 FHEQ (Framework for Higher Education Qualifications) level 7 credits and a University of Cambridge award (Units 1 and 2).

Postgraduate Diploma (PgDip) in Healthcare Data: Informatics, Innovation and Commercialization
A two-year part-time Master’s level programme resulting in 120 FHEQ level 7 credits and a University of Cambridge award (Units 1 to 5).

Master of Studies (MSt) in Healthcare Data: Informatics, Innovation, and Commercialization
A two-year part-time Master’s level programme resulting in 180 FHEQ level 7 credits and a University of Cambridge degree (Units 1 to 5 and Unit 6, a research dissertation).

Course Units
The programme is structured across the following six units of study:

<table>
<thead>
<tr>
<th>Unit</th>
<th>Description</th>
<th>Credit Allocation</th>
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<tbody>
<tr>
<td>Unit 1</td>
<td>Research skills, governance and innovation</td>
<td>20 credits</td>
</tr>
<tr>
<td>Unit 2</td>
<td>Data structures, storage and queries</td>
<td>40 credits</td>
</tr>
<tr>
<td>Unit 3</td>
<td>Finding relationships and data visualisation</td>
<td>20 credits</td>
</tr>
<tr>
<td>Unit 4</td>
<td>Healthcare systems improvement</td>
<td>20 credits</td>
</tr>
<tr>
<td>Unit 5</td>
<td>Medical technology innovation and commercialization</td>
<td>20 credits</td>
</tr>
<tr>
<td>Unit 6</td>
<td>Dissertation</td>
<td>60 credits</td>
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Each 20 credits of study is roughly equivalent to 200 hours of study which will consist of face to face teaching, blended, and self-directed learning. This is an indicative amount and it is recognised that individuals may engage in greater or lesser amounts of study for each unit.
### Course Overview

<table>
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<tr>
<th>Academic year 1: October 2020 - June 2021</th>
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**Unit 1 - Research Skills, Governance, and Innovation (20 Credits)**

| Start Date | 1 October 2020 |
| Teaching Week | 5 – 9 October 2020 |

Madingley Hall and The Wellcome Genome Campus

**Unit 2: Data Structures, Storage and Queries (40 Credits)**

**Unit 2: Week 1**

| Start Date | 4 January 2021 |
| Teaching Week | 11 – 15 January 2021 |

Cambridge Biomedical Campus

**Unit 2: Week 2**

| Start Date | 12 April 2021 |
| Teaching Week | 12 – 16 April 2021 |

Cambridge Biomedical Campus

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<th>Academic year 2: October 2021 - July 2022</th>
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**Unit 3: Finding Relationships and Data Visualisation (20 Credits)**

| Start Date | 27 September 2021 |
| Teaching Week | 18 – 22 October 2021 |

Madingley Hall

**Unit 4: Healthcare Systems Improvement (20 Credits)**

| Start Date | 3 January 2022 |
| Teaching Week | 17 – 21 January 2022 |

Madingley Hall

**Unit 5: Medical Technology Innovation and Commercialization (20 Credits)**

| Start Date | 11 April 2022 |
| Teaching Week | 25 – 29 April 2022 |

Madingley Hall

**Unit 6: Research Dissertation (60 credits)**

| Deadline | 29 July 2022 |

Please be aware that the dates shown above are as yet provisional and may be subject to change.
Unit Descriptions

Unit 1: Research Skills, Governance and Innovation (20 Credits)
Unit 1 provides the landscape to understand the breadth of patient level data in the healthcare and economic landscape in the UK and globally. It provides knowledge of the technical, legal, and ethical infrastructure which guides all research, commercial development, and healthcare quality improvement. Furthermore, it introduces key concepts from subsequent parts of the course to allow students to develop their thinking around systems engineering, statistics and data visualisation, and innovation. Students will be taught by a faculty of experts from genomics, clinical medicine, informatics, statistics, business, and engineering. Masterclass sessions will use case studies to examine the impact of healthcare data.

Unit 2: Data Structures, Storage and Queries (40 Credits)
Unit 2 is a 40 credit unit, the largest in the programme, and delivers all of the health informatics training needed for students to be able to independently design and execute queries of raw electronic patient record data. The practical aspects of the unit will focus on the Epic system but the theoretical components will take a platform agnostic approach to covering data structures and healthcare database design. Students completing this unit will be competent in the use of the programming and scripting languages which are used globally to analyse healthcare data. Faculty will be drawn from clinical informaticians, researchers, and commercial sector software experts. Masterclasses will explore the practical aspects of patient level data extraction and analysis.

Unit 3: Finding Relationships and Data Visualisation (20 Credits)
The ability to visualise results of healthcare data research and quality improvement projects is essential yet is rarely taught. Moreover, design theory and practice is uncommonly included within health informatics courses. Unit 3 is an entirely novel, innovative approach to teaching statistics and data visualisation as it applies to healthcare data and will allow the clear presentation and explanation of novel information arising from patient level data projects. The unit will use real healthcare data datasets to develop understanding of practical statistics primarily using R. Students will also be taught design and visualisation theory and practice, and tools to enhance their ability to present results from large datasets in clear, interesting, and visually appealing ways. Faculty will be drawn from statisticians, data scientists, genomic scientists, and graphic design experts.

Unit 4: Healthcare Systems Improvement (20 Credits)
Healthcare faces considerable challenges and the complexity of the system mean that efforts to improve it often achieve only limited benefits and frequently have unforeseen consequences. Over the past two decades, there have been numerous calls to implement a systems approach to transform healthcare; however, there has been no clear definition of what this might mean. Engineers routinely use a systems approach to address challenging problems in complex projects and this allows them to work through the implications of each change for the project as a whole. They consider the layout of the system, defining all the elements and interconnections, to ensure that the whole system performs as required. This module will apply a systems engineering approach to the process of data-driven change in healthcare environments allowing students to understand and measure the consequences of any change introduced due to analysis of complex healthcare datasets. This unit will enable students to understand healthcare systems before making data-driven changes. This will allow students to become experts in balancing the differing needs of users, assessing risk, and then implementing change and assessing effectiveness of system change within hospitals, pharmaceutical companies, and health research charities.
Unit 5: Medical Technology Innovation and Commercialization (20 Credits)

In Unit 5, we will look at a range of skills required for innovation. Firstly, we will examine the difference between “entrepreneurial” and “intrapreneurial” opportunities and the paths entrepreneurs and intrapreneurs need to walk. Secondly, we will consider the range of business models currently fashionable and interesting in the medtech data space, and how this range of business models may evolve over time. Finally, we will investigate the question of medtech innovation strategy—how medium and large players in the medtech space manage their innovation portfolios and the implications for individual innovators. By the end of the unit, students should have a good grasp of the choices in front of them in terms of commercialization, and the critical success factors for successful innovation.

Unit 6: The Research Dissertation (60 Credits)

For MSt students only: During Year 1 of study the main focus will be on the successful completion of course work, but it will be important to think about the dissertation in preparation for year 2.
Assessment

Essays, projects and written papers
Units 1-5 will use summative assessment approaches designed to ensure experiential learning and work-based real-life relevance. Approaches may include, but are not limited to: critical analysis of case-studies, assessment of evidence-based portfolios, assessment of work and sector relevant group presentations and projects, short answer questions, essays, and the ability to handle, analyse and visualise unseen datasets.

Generally, the assessments are released at the end of each teaching week and the submission date is approximately 8 weeks later.

The Dissertation (MSt students only)
Unit 6 is the research dissertation. Most work will be done in the second year of study and students are required to achieve a pass mark in order to receive the award of Master of Studies.

Attendance and participation
Attendance at all of the units in Cambridge is compulsory and full and active participation in all elements of the course is expected.

Supervision and Feedback
Students will receive formative and peer-based feedback throughout the course, along with tutor provided feedback on the submitted summative assignments. During the first year and the taught modules, the primary responsibility for supervision of students lies with the module leaders and Course Director.

MSt students will have a dissertation supervisor assigned who will provide guidance on their research project for Unit 6.

Madingley Hall and Cambridge Colleges
MSt students become a member of a Cambridge college. For the MSt in Healthcare Data we have an arrangement with the colleges below to accept our students. You will be asked to select your preference at point of application although both these colleges have been selected in recognition of their particular support for part-time students.

- Homerton College
- Wolfson College

It may be possible to become a member of an alternative college should an applicant have a previous affiliation. However, we believe, and feedback from previous students, tells us that students have a more positive experience as part of a college group.

Our Postgraduate Certificate and Diploma students should see Madingley Hall as their Cambridge course home. Madingley Hall is a beautiful venue and you will be welcome to spend time here, use the facilities and our library.
How To Apply

Applications will be accepted online until 20th May 2020.

Entry Requirements

Academic requirement
Applicants for this course are expected to have achieved a UK 2.1 honours degree or equivalent.

It is preferred that an applicant's first degree be in a subject relevant, or related to, life sciences, medical sciences, computational or data science.

Language requirement

 IELTS Academic: Overall score of 7.0 (a minimum of 7.0 in Listening, Writing and Speaking; 6.5 in Reading)
 TOEFL Internet: Overall score of 100 (a minimum of 25 in each individual component)
 CAE: Grade A or B (with at least 193 in each individual element) plus a Language Centre assessment
 CPE: Grade A, B, or C (with at least 200 in each individual element)

Fees for Academic Year 2020 to 2021

<table>
<thead>
<tr>
<th>Course</th>
<th>Home/EU</th>
<th>Overseas fee</th>
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<tbody>
<tr>
<td>Postgraduate Certificate in Healthcare Data</td>
<td>£5,000</td>
<td>£9,000</td>
</tr>
<tr>
<td>Postgraduate Diploma in Healthcare Data</td>
<td>£10,000</td>
<td>£18,000</td>
</tr>
<tr>
<td>Mst in Healthcare Data</td>
<td>£15,000</td>
<td>£27,000</td>
</tr>
</tbody>
</table>

Other costs

Students will be expected to cover the application fee (£65 online) and any costs of travel, accommodation and subsistence during the teaching weeks in Cambridge. Please note that students will require the use of a laptop for the duration of the course.

Documents required in support of application

In addition to completing an online application, applicants will be asked to provide:

 Academic transcripts
 Two references
 A Curriculum Vitae (CV)
 Evidence of competence in English (if appropriate)

Selection process

 Stage 1: Applications are reviewed by the course team after the application closing date.
 Stage 2: Selected applicants will be invited for interview
 Stage 3: Conditional offer of places will be made approximately 4-6 weeks after the application closing date.
For further information:

For admission specific enquiries
Admissions Team - Institute of Continuing Education
University of Cambridge
Madingley Hall, Madingley
Cambridge
CB23 8AQ
United Kingdom
Email the admissions team at: admissions@ice.cam.ac.uk
Tel: +44 (0)1223 746262

For general and course related enquiries
Postgraduate STEM - Institute of Continuing Education
Madingley Hall
Madingley
Cambridge
CB23 8AQ
United Kingdom
Email the programme team at: healthcaredata@ice.cam.ac.uk