**Module Specification**

**Module Summary Information**

|  |  |  |
| --- | --- | --- |
| **1** | **Module Title** | Introduction to Principles and Approaches of Data Science for Healthcare Applications |
| **2** | **Module Credits** | 20 |
| **3** | **Module Level** | 7 |
| **4** | **Module Code** | TBD |
| **5** | **Semester Taught** | 2 |

|  |  |
| --- | --- |
| **6** | **Module Overview** |
| This module will provide you the knowledge and understanding of data science principles and approaches for healthcare applications to allow you to develop health data science skills and abilities for improving healthcare. You will develop the core skills and expertise needed for healthcare applications in the field of data analytics, including the use of the popular and powerful data analysis language and environment R.  This module will also introduce you to the concepts and practicalities of programming in R. You will learn to explore, visualise, and analyse health data to understand data science principles, investigate patterns, model outcomes, and make predictions for medical applications.  A variety of teaching methods will be used, including lectures, tutorials, computer practical’s, problem solving group work, and self-directed learning. | |

|  |  |
| --- | --- |
| **7** | **Indicative Content** |
| * An introduction to concepts and modalities in data science used for medical applications. * An introduction to the concepts and practicalities of programming as implemented in R. * Application of data science approaches for a real-life health or life sciences problem / case study in practice, reporting and presentation of the obtained results. * Data sources and systems relevant to health data science in the UK and abroad. * Ethical issues and processes, with a focus on current controversies relevant to health data science (including data ownership, consent, ethics of algorithms). | |

|  |  |  |
| --- | --- | --- |
| **8** | **Module Learning Outcomes**  **On successful completion of the module, students will be able to:** | |
|  | **1** | Demonstrate a systematic understanding of the principles and approaches in data science to be used in healthcare. |
|  | **2** | Critically appraise the key considerations for using healthcare data including ethics, information governance and security issues relevant to health data science. |
|  | **3** | Critically design and analyse solutions to healthcare data programming problems using help facilities and on-line resources in R in a multidisciplinary working group. |
|  | **4** | Critically evaluate the strengths and limitations of R used in healthcare applications. |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **9** | **Module Assessment** | | | |
|  | |  | | |
| **Learning Outcome Number** *(from table 8)* | | **Coursework** | **Exam** | **In-Person** |
| **1-4** | | Report 100% |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **10** | **Breakdown Learning and Teaching Activities** | | |
| **Learning Activities** | | **Hours** | **Details of Duration, Frequency and other comments** |
| **Scheduled Learning (SL)**  includes lectures, practical classes and workshops as specified in timetable | | 36 | * Scheduled learning will be spread across various theoretical and practical learning and teaching elements of this module. * Blended learning approach will be suitably adopted in the delivery of circa 24 hours of scheduled learning hours. For instance; 1 hour flipped learning will be followed either by a face to face – interactive workshop(s) / Seminar(s) (each lasting for circa, 2 hours) and or synchronous tutorials / consolidation sessions. * The remaining time as part of the scheduled learning hours will contribute towards hands on practical activities to be undertaken as part of this module and approximately, this will be spread across 6 x 2 hour sessions (12 hours) and this may also need access to specialist teaching space / equipment’s. |
| **Directed Learning (DL)**  includes placements, work-based learning, peer group learning external visits, on-line activity, Graduate+, peer learning, as directed on VLE | | 60 | * Directed learning for this module will be predominantly supported via learning and teaching materials uploaded on to the virtual learning platform – Moodle. * Flipped learning materials (in the form of either asynchronous lecture materials (30 to 45 minutes maximum)/ revisiting some of the technical concepts from previous learning / journals, etc.), where appropriate, will be made available via the VLE, which would direct the student learning and prepare the students to engage in workshops / seminars and practical activity session’s as part of the scheduled student learning. * Technical insights provided to or obtained by students via industrial mentors / visits, where appropriate, will enable students to engage in peer discussions and will feed into the workshops / seminars planned and delivered as part of scheduled student learning activities. * Where appropriate the digital footprint of such peer activities will be carefully reposited in the dedicated module Moodle site. * Student engagement in various directed / scheduled learning activities will be appropriately cascaded to various formative / feed-forward activities and where appropriate these will also be streamlined to the university Grad+ recognition scheme. |
| **Private Study (PS)**  includes preparation for exams | | 104 | PS includes gathering information on applications and details of the experimental and computational techniques which are covered, as well as the specific information relevant to the experiment designed for the coursework. PS includes assignment preparation. |
| **Total Study Hours:** | | 200 | |

|  |  |
| --- | --- |
| **11** | **Key Texts and Online Learning Resources** |
| **Core reading:**  Consoli S., Recupero D. R. and Petković M. (2019) *Data Science for Healthcare*. Springer Nature Switzerland.  Wickham H. and Grolemund G. (2021), *R for Data Science.* Available at: https://r4ds.had.co.nz/index.html [Accessed 5 March 2021].  **Wider reading:**  Tomas J. A. (2021), *Population Health Data Science with R: Transforming data into actionable knowledge.* Available through: https://bookdown.org/medepi/phds/ [Accessed 5 March 2021].  Gareth J., Daniela W., Trevor H. and Robert T. (2017) *An Introduction to Statistical Learning: with Applications in R*. 7th edn, New York: Springer-Verlag.  James G., Witten D., Hastie T. and Tibshirani R. (2017) *An Introduction to Statistical Learning: with Applications in R.* 7th edn, New York: Springer-Verlag New York Inc.  Grolemund G. (2021) *Hands-On Programming with R*. Available through: https://rstudio-education.github.io/hopr/ [Accessed 5 March 2021].  Peng, R. D. (2020) R Programming for Data Science https://bookdown.org/rdpeng/rprogdatascience/ [Accessed 5 March 2021].  Matloff, N. (2009) *The Art of R Programming*. Available through: http://heather.cs.ucdavis.edu/~matloff/132/NSPpart.pdf [Accessed 8 March 2021]. | |