Imperial College London

Artificial Intelligence and Data Science for Healthcare Innovation

From patients to python, thought of becoming a Dr Data Scientist?

Join this online summer programme by Imperial's Data Science Institute

8-19 August 2022, Online via MS Teams

IMPERIAL COLLEGE LONDON AND THE DATA SCIENCE INSTITUTE

Consistently rated amongst the world's best universities (4th in Europe and 9th in World, QS World University Rankings 2020), Imperial College London is a science-based institution with an international reputation for excellence in teaching and research. Imperial attracts over 17,000 students and 8,000 staff of the highest international quality from over 136 different countries.

Since its foundation in 1907, Imperial's contributions to society have included the discovery of penicillin, the development of holography and the foundations of fibre optics. This commitment to the application of research for the benefit of all continues today, with current areas of focus including interdisciplinary collaborations to improve global health, tackle climate change, develop sustainable sources of energy, address security challenges, develop data management and analysis technologies for supporting data driven research, and tackling problems at molecular scale.

Imperial's Centre for Continuing Professional Development has extensive experience in developing and running a range of online summer schools for undergraduate students. We draw on Imperial's education pedagogy in online learning to design and deliver summer schools that provide an engaging learning experience for students. Various interactive applications are used to support live teaching and online group projects are designed to assess students' learning outcomes.

The Data Science Institute (DSI) is a major Imperial College London initiative that brings together Imperial's existing data science activities and expertise which provides a focus and a catalyst for new partnerships.

The DSI supports multidisciplinary collaborations between the College's academic experts in many disciplines such as healthcare, financial services, climate science, and city infrastructure to create solutions to complex problems. Alongside research, the Institute fosters the next generation of data scientists and engineers by developing a range of postgraduate and executive courses.

In the past 6 years since its creation, the DSI includes 7 Academic Labs, has attracted over £50m in funding for data science research, technology and infrastructure and has published over 300 papers. The Institute's Data Observatory (DO) was one of the first and largest visualisation suites in Europe. It provides a multi-dimensional and immersive environment to analyse large and complex data sets and to work collaboratively.

Thanks to its many research collaborations both across College and with a variety of external academic and industrial partners, the DSI is establishing its role as an international hub in data science.

WHY ATTEND THIS SUMMER SCHOOL

In the healthcare industry, data science and artificial intelligence (AI) play a pivotal role in bringing together innovation and patient care and they have the potential to transform how healthcare is delivered.

Healthcare data open the road to many discoveries. For example, it provides the foundation to run medical evaluation and to produce more effective drugs more quickly. Data scientists are using powerful predictive analytical tools to detect chronic diseases at an early level and to identify successful interventions quickly. Analytical tools will make possible to identify more quickly the best drug for a certain treatment as well as the most efficient route to produce it. Data science allows a better quality of care for patients, freeing up doctors' time by running tedious analyses in a more efficient way, enabling doctors to spend more time in direct patient care and reducing burnout.

AI can support improvements in care outcomes, patient experience and access to healthcare services. It can increase productivity and the efficiency of care delivery and allow healthcare systems to provide more and better care to more people. AI can help improve the experience of healthcare practitioners and patients alike.

For these reasons, knowledge of data science and AI is successfully adding value to healthcare innovations and a growing number of organisations and hospitals are now looking for these skills set in their recruitment.

This online summer school is designed for undergraduate students with non-technical coding backgrounds, including those studying medicine, with an interest in enhancing their skills to work in the healthcare industry.

Students will be introduced to the concept of data science and AI, hear from industry experts on these applications and work in teams towards a group project.

On completion of this summer school, students will be able to:

- Develop an understanding of data science and AI's application in healthcare.
- Explain how AI is applied in medical imaging and how machine learning is used for data analysis.
- Understand how medical robotics play an important role in healthcare innovation.
- Understand how data are presented using visualisation tools.
- Understand how healthcare data can be kept safely with blockchain and how AI is used to assist electronic health records.
- Explain the importance of data privacy and ethics.
- Apply basic coding in Python.
- Identify valuable professional skills in team building, communication and presentation and apply on team-based project.
- Improve their English language.

Students will be working in small teams to work on a group project, supervised by Imperial academics and they will present the project to a panel of experts on the last day of the programme.
In addition, students will participate in online social activities, meet new friends and hear about opportunities for international students at Imperial.

PROGRAMME STRUCTURE AND FORMAT

33.5 learning hours spread over two weeks covering live lectures, tutorials, project work and self-study time.

Live sessions of up to 3.5 hours' duration will be delivered on weekdays over a two-week period. Classes are delivered from 08:00 UK time / 15:00 China time.

Project work will be done through team-based learning with supervision. Final projects will be presented in groups to a panel of experts on the last day of the programme. A prize will be awarded to the team with the best project.

The programme will be delivered over Microsoft Teams. Online project channels will be allocated to each team for project work and tutorials. Students will be able to use the channel at any time to work on their project.

The entire programme will be taught in English.

CERTIFICATION

Students will receive a verified Imperial College London digital certificate on successful completion of the summer school and a prize will be awarded to the best project team. Each student will also receive a transcript for their project marks.

ENTRY REQUIREMENTS

All students are expected to be studying an undergraduate degree at a well-recognised university in China meeting the following entry requirements.

English requirements:

All students are required to have a good command of English, and if it is not their first language, they will need to satisfy the College requirements as follows:

- a minimum score of IELTS (Academic Test) 6.5 overall (with no less than 6.0 in any element) or equivalent.
- TOEFL (iBT) 92 overall (minimum 20 in all elements)
- CET- 4 (China) minimum score of 550
- CET- 6 (China) minimum score of 520

Students will need to have access to a computer pre-installed with python, have a webcam, microphone and good internet connection to attend the live classes. Guidance will be provided to students on installing python.

Students are NOT expected to have any technical coding skills.

This summer school is also suited for students studying medicine, looking to diversify their skill set.

TEACHING FACULTY

The summer school is co-directed by Professor Yike Guo and taught by a multi-disciplinary teaching faculty from the Data Science Institute and other departments at Imperial College London.

Professor Yike Guo
Co-Director of the Data Science Institute
Professor of Computing Science
Imperial College London

Yike Guo is Professor of Computing Science in the Department of Computing at Imperial College London. He is the founding Director of the Data Science Institute at Imperial College. He is a Fellow of the Royal Academy of Engineering (FREng), Member of Academia Europaea (MAE), Fellow of British Computer Society and a Trustee of The Royal Institution of Great Britain.

Professor Guo received a first-class honours degree in Computing Science from Tsinghua University, China, in 1985 and received his PhD in Computational Logic from Imperial College in 1993 under the supervision of Professor John Darlington. He founded InforSense, a software company specialized in big data analysis for life science and medicine, and served as CEO for several years before the company's merger with IDBS, a global advanced R&D software provider, in 2009. He was then the Chief Innovation Officer of the IDBS until 2018. He also served as the Chief Technical Officer of the tranSMART foundation, a global alliance in building open source big data platform for translational medicine research.

He has been working on technology and platforms for scientific data analysis since the mid-1990s, where his research focuses on data mining, machine learning and large-scale data management. He has contributed to numerous major research projects including: the UK EPSRC platform project, Discovery Net; the Wellcome Trust-funded Biological Atlas of Insulin Resistance (BAIR); and the European Commission U-BIOPRED project. He was the Principal Investigator of the European Innovative Medicines Initiative (IMI) eTRIKS project, a €23M project building a cloud-based informatics platform, in which tranSMART is a core component for clinico-genomic medical research, and co-Investigator of Digital City Exchange, a £5.9M research programme exploring ways to digitally link utilities and services within smart cities.

Professor Guo has published over 250 articles, papers and reports. Projects he has contributed to have been internationally recognised, including winning the “Most Innovative Data Intensive Application Award” at the Supercomputing 2002 conference for Discovery Net, the Bio-IT World "Best Practices Award" for U-BIOPRED in 2014 and the "Best Open Source Software Award" from ACM SIGMM in 2017.

Photos above: Data Science Institute 360 degree observatory and Professor Yike Guo hosting a visit of President Xi Jingping in October 2015.

Provisional programme:

Artificial Intelligence and Data Science for Healthcare Innovation

- An online summer programme by Imperial's Data Science Institute

Pre-sessionals		
6 August 2022		
UK time	**Beijing time**	
07:00	14:00	Orientation
08:00	15:00	Cross-cultural Communication
7 August 2022		
UK time	**Beijing time**	
07:00	14:00	Academic Writing
08:00	15:00	Workshop
Week 1:		
Day 1		
UK time	**Beijing time**	
08:00	15:00	**Welcome and Introduction to Imperial College London**
08:15	15:15	**Programme overview & Group Photo**
08:45	15:45	**What is Data Science?**
09:45	16:45	Break
10:00	17:00	**Social activity 1**
11:00	18:00	End of day
Day 2		
UK time	**Beijing time**	
08:00	15:00	**Introduction to Artificial Intelligence**
09:30	16:30	Break
09:45	16:45	**Group project briefing and planning**
11:15	18:15	End of day
Day 3		
UK time	**Beijing time**	
08:00	15:00	**AI in medical imaging (computer vision application)**
09:30	16:30	Break
09:45	16:45	**Machine Learning for Data Analysis**
11:15	18:15	End of day
Day 4		
UK time	**Beijing time**	
08:00	15:00	**AI -assisted electronic health records (natural language processing application)**
09:30	16:30	Break
09:45	16:45	**Python foundation for group project**
10:45	17:45	**Project Q&A**
11:45	18:45	End of day
Day 5		
UK time	**Beijing time**	
07:45	14:45	**Transforming the future of healthcare with data science**
09:15	16:15	Break
09:30	16:30	**Effective Communication for Presentation**
11:00	18:00	End of day
Week 2:		
Day 6		
UK time	**Beijing time**	
08:00	15:00	**Present your data using visualisation tools**

09:30	16:30	Break
09:45	16:45	**Project Q&A**
10:45	17:45	**Social activity 2**
11:45	18:45	End of day
Day 7		
UK time	**Beijing time**	
08:00	15:00	**Innovations in medical robotics**
09:30	16:30	Break
09:45	16:45	**Beyond Bitcoin - Keep the healthcare data safe with Blockchain**
11:15	18:15	End of day
Day 8		
UK time	**Beijing time**	
08:00	15:00	**Data Science and AI in the pharmaceutical industry**
09:30	16:30	Break
09:45	16:45	**Opportunities for International Students**
10:45	17:45	**Project Q&A**
11:45	18:45	End of day
Day 9		
UK time	**Beijing time**	
08:00	15:00	**The Importance of Data Privacy & Ethics**
09:30	16:30	Break
09:45	16:45	**The Future of Data Science - Discussion with the students**
10:45	17:45	*Self-study: Preparation for project presentation*
11:45	18:45	End of day
Day 10		
UK time	**Beijing time**	
		Project presentation
08:00	15:00	**Group 1**
08:15	15:15	**Group 2**
09:00	16:00	**Group 3**
09:15	16:15	**Group 4**
09:30	16:30	**Group 5**
09:45	16:45	**Group 6**
10:00	17:00	**Group 7**
10:15	17:15	**Group 8**
10:30	17:30	**Group 9**
10:45	17:45	**Group 10**
11:00	18:00	**End of presentation & break**
		Students to complete online evaluation
11:30	18:30	**Judging panel reconvene**
		Presentations feedback and announcement of winning team
12:00	19:00	**End of programme**