课程详述

COURSE SPECIFICATION

以下课程信息可能根据实际授课需要或在课程检讨之后产生变动。如对课程有任何疑问，请联系授课教师。

The course information as follows may be subject to change, either during the session because of unforeseen circumstances, or following review of the course at the end of the session. Queries about the course should be directed to the course instructor.

1.	**课程名称 Course Title**	大数据与公共健康管理 Big Data and Public Health
2.	**授课院系** **Originating Department**	高等教育研究中心 Center for Higher Education Research
3.	**课程编号** **Course Code**	ITC02
4.	**课程学分 Credit Value**	2
5.	**课程类别** **Course Type**	任选课 Free Elective
6.	**授课学期** **Semester**	秋季 Fall
7.	**授课语言** **Teaching Language**	英文 English
8.	**授课教师、所属学系、联系方式（如属团队授课，请列明其他授课教师）** **Instructor(s), Affiliation& Contact** **（For team teaching, please list all instructors）**	
9.	**实验员/助教、所属学系、联系方式** **Tutor/TA(s), Contact**	无 NA
10.	**选课人数限额(可不填)** **Maximum Enrolment（Optional）**	

11.	授课方式 Delivery Method	讲授 Lectures	习题/辅导/讨论 Tutorials	实验/实习 Lab/Practical	其它(请具体注明) Other（Please specify）	总学时 Total
	学时数 Credit Hours	32	0	0	0	32

12.	先修课程、其它学习要求 Pre-requisites or Other Academic Requirements	无 No
13.	后续课程、其它学习规划 Courses for which this course is a pre-requisite	无 No
14.	其它要求修读本课程的学系 Cross-listing Dept.	无 No

教学大纲及教学日历 SYLLABUS

15. 教学目标 Course Objectives

从制造自动驾驶汽车到开发个性化医疗保健，利用数据可以帮助科学家和工程师实现惊人的突破。然而，除非我们学会如何理解、解释数据以及如何从数据中提取隐式模式，否则仅靠捕获和整理数据本身是没有用的。在这门课中我们会讲到

1. 如何调整数据以使其适应各种技术和科学，如人工智能、机器学习等；

2. 数据科学、机器学习、统计学和人工智能背后的基本思想；

3. 在大多数数据驱动项目中必不可少的一些方法和技术；

4. 由人工智能和机器学习驱动的医疗保健技术，以及在医疗保健和流行病学中使用技术的挑战。

Harnessing data can help scientists and engineers achieve astonishing breakthroughs from building autonomous cars to developing personalized healthcare. However, capturing and collating data by itself cannot be useful unless we learn how to understand them, interpret them and how to extract patterns, often implicit, from them. In this course we talk about

1. How to tweak data to be amenable to various techniques and sciences such as Artificial Intelligence, Machine Learning, etc.

2. We will try to learn basic ideas behind data science, machine learning, statistics and AI.

3. We will work on few methods and techniques that are essential in most data driven projects.

4. We will extensively discuss technologies in healthcare powered by AI and Machine Learning. Challenges in using technology in Healthcare and Epidemiology.

16. 预达学习成果 Learning Outcomes

1. 大数据、人工智能和机器学习概论；推理技巧，演绎，归纳，溯因等

Introduction to Artificial Intelligence and Machine Learning

Reasoning Techniques, Deductive, Inductive, Abductive, etc

2. 移动医疗、远程医疗、电子医疗和医疗保健政策制定

•mHealth, Telehealth, eHealth, Telemedicine

•Policy making in healthcare

3. 预测和诊断中使用人工智能

How to use AI in prognostics and diagnostics

4.在医疗保健中使用机器学习的挑战；评估预测模型

Challenges of using ML in healthcare

Evaluating Prediction models

17. 课程内容及教学日历 （如授课语言以英文为主，则课程内容介绍可以用英文；如团队教学或模块教学，教学日历须注明主讲人）
Course Contents (in Parts/Chapters/Sections/Weeks. Please notify name of instructor for course section(s), if this is a team teaching or module course.)

模块 1：大数据与人工智能（6 学时）

Module 1: **Big Data and Artificial Intelligence**（6 hours）

大数据、人工智能是目前大家谈论比较多的话题，它们的应用也越来越广泛、与我们的生活关系也越来越密切，影响也越来越深远，其中很多已进入寻常百姓家，如无人机、网约车、自动导航、智能家电、电商推荐、人机对话机器人等等。

大数据是人工智能的基础，而使大数据转变为知识或生产力，离不开机器学习（Machine Learning），可以说机器学习是人工智能的核心，是使机器具有类似人的智能的根本途径。

Big data and artificial intelligence are currently the hot topics that everyone talks about. Their applications are becoming more and more extensive, their relationship with our lives is getting closer, and their impact is becoming more and more far-reaching. Many of them have entered the homes of ordinary people, such as Drones, online car-hailing, automatic navigation, smart home appliances, e-commerce recommendations, man-machine dialogue robots, etc.

Big data is the foundation of artificial intelligence, and the transformation of big data into knowledge or productivity is inseparable from machine learning. It can be said that machine learning is the core of artificial intelligence and the fundamental way to make machines have human-like intelligence.

模块 2：现代医疗保健技术（6 学时）

Module 2: Technologies in Healthcare（6 hours）

数字化创新正在迅速推动现代各行各业的转型。来自医院和医疗保健系统的医疗保健提供者正在应用这些工具，提高广大人民群众的健康水平，降低成本并改进体验。

医疗保健提供者现在有更多可供选择的技术来支持循证医疗护理，且他们可以利用新的互动系统来改善患者和提供者的护理体验。该技术是行业演进的一部分，未来医疗保健各个学科和基于价值的医疗护理将更加紧密的整合在一起，相互协作。

Digital innovation is rapidly promoting the transformation of modern industries. Healthcare providers from hospitals and healthcare systems are applying these tools to improve the health of the general public,

reduce costs and improve the experience.

Healthcare providers now have more alternative technologies to support evidence-based medical care, and they can use new interactive systems to improve the care experience for patients and providers. This technology is part of the evolution of the industry. In the future, various disciplines of healthcare and value-based healthcare will be more closely integrated and collaborate with each other.

模块 3：无线健康系统（8 学时）

Module 3: Wireless Health Technologies and applications（8 hours）

无线健康系统是用医学传感、无线网络、信号处理、数据挖掘等信息技术建设起来的系统，通过采集心电、血压、体温等生命体征信息，传输和存储到数据库，实现远程医疗中心实时调取数据和电子健康记录，实现新一代的实时监护、保健、辅助治疗。

The wireless health system is a system built with information technologies such as medical sensing, wireless network, signal processing, and data mining. It collects vital signs information such as ECG, blood pressure, body temperature, and transmits and stores it in the database to realize the real-time adjustment of the telemedicine center, obtain data and electronic health records to achieve a new generation of real-time monitoring, health care, and auxiliary treatment.

模块 4：人工智能与流行病学（6 学时）

Module 4: AI and Epidemiology（6 hours）

作为一门与数据息息相关的学科，流行病学正处于"大健康""大数据""人工智能"时代带来的学科发展机遇期，但在数据标准化与共享、检测技术与分析方法、法律和伦理规范与制度等方面尚存在诸多挑战。

As a discipline closely related to data, epidemiology is in a period of opportunities for discipline development brought by the era of "big health", "big data" and "artificial intelligence". There are still many challenges in ethical norms and systems.

模块 5：医疗保健与机器学习（6 学时）

Module 5: Healthcare and Machine Learning（6 hours）

计算机科学中的机器学习的目的是使机器更加高效和可靠。在医疗保健领域，机器是医生大脑的延伸和力量的倍增器。毕竟，病人总是需要人的触摸和照顾，而机器是无法提供的。因此，机器的工作不是要取代医生，而是要帮助医生提供更好的服务和护理。

The purpose of machine learning in computer science is to make machines more efficient and reliable. In the field of healthcare, machines are an extension of the doctor’s brain and a power multiplier. After all, patients always need human touch and care, and machines cannot provide them. Therefore, the job of the machine is not to replace the doctor, but to help the doctor provide better service and care.

18. 教材及其它参考资料 Textbook and Supplementary Readings

1. Lecture notes

2. Norvig, P.R. and Intelligence, S.A., 2002. A modern approach. Upper Saddle River, NJ, USA: Prentice Hall.

3. Mitchell, T.M., 1997. Machine learning. 1997. Burr Ridge, IL: McGraw Hill, 45(37), pp.870-877.

课程评估 ASSESSMENT

19.

评估形式 Type of Assessment	评估时间 Time	占考试总成绩百分比 % of final score	违纪处罚 Penalty	备注 Notes
出勤 Attendance		20		
课堂表现 Class Performance				
小测验 Quiz				
课程项目 Projects				
平时作业 Assignments		80		
期中考试 Mid-Term Test				
期末考试 Final Exam				
期末报告 Final Presentation				
其它（可根据需要改写以上评估方式） Others (The above may be modified as necessary)				

20. 记分方式 GRADING SYSTEM

☐ A. 十三级等级制 **Letter Grading**
√ B. 二级记分制（通过/不通过） **Pass/Fail Grading**

课程审批 REVIEW AND APPROVAL

21. 本课程设置已经过以下责任人/委员会审议通过
This Course has been approved by the following person or committee of authority