

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 Big Data
2.	授课院系 Originating Department	系统设计与智能制造学院 School of System Design and Intelligent Manufacturing
3.	课程编号 Course Code	SDM371
4.	课程学分 Credit Value	3
5.	课程类别 Course Type	专业选修课 Major Elective Courses
6.	授课学期 Semester	秋季 Fall
7.	授课语言 Teaching Language	英语 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)	吴迪, 兼职产业教授 系统设计与智能制造学院 (设计智造学院) WU Di, Professor of Engineering Practice School of System Design and Intelligent Manufacturing (SDIM) Email: james.wu@fjdynamics.com
9.	实验员/助教、所属学系、联系方式 Tutor/TA(s), Contact	待公布 To be announced
10.	选课人数限额(可不填) Maximum Enrolment (Optional)	待公布 To be announced

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
	32	0	32	0	64
学时数 Credit Hours					
12. 先修课程、其它学习要求 Pre-requisites or Other Academic Requirements	MA107A 线性代数 A Linear Algebra A				
13. 后续课程、其它学习规划 Courses for which this course is a pre-requisite	无 NIL				
14. 其它要求修读本课程的学系 Cross-listing Dept.	无 NIL				

教学大纲及教学日历 SYLLABUS

课程介绍在按照摩尔定律发展的半导体技术驱动下，随着算力和数据的高速增长，大数据如何成为类似瓦特蒸汽机的新一轮工业革命推手。本课程从半导体技术发展开始，着重讲解从低功耗 IoT 节点到边缘计算再到云端数据中心的相关技术的基本概念，结合产业界案例介绍具体的应用和技术路线的演进。

This course is about the historical phenomenon that driven by modern semiconductor technologies that follows Moore's law, the amount of computing power and data available has grown unprecedentedly, making big data the powerhouse of the next industrial revolution like Watt's steam engine did in the 18th century. This course starts from the evolution of semiconductor technologies (sand) and ends in the latest progress in cloud computing (cloud). While elaborating basic concepts such as low-power IoT nodes, edge-computing and cloud computing at data centers, it also addresses the evolution of relevant industries with several case studies.

16. 预达学习成果 Learning Outcomes

希望学生掌握大数据采集处理的基本手段，了解大数据背后计算机和通信技术的发展，和大数据在相关行业领域的落地方向，掌握相关方向正确方法论，认清人工智能热潮中的真伪命题，能够识别并跟踪具备真正价值的方向，在此基础上寻找创新的机会。

The course is taught in English, bearing in mind that fellow students shall learn basic methods of bigdata collection and processing, understand the development of computer engineering and communication technologies that drives bigdata and relevant application fields of bigdata, learn to build their own methodology and be able to identify pitfalls in industrial hypes such as the recent AI hype. More importantly, students are expected to master the way to identify "real problems" among many potential directions before they can devote them to solving these problems with innovation.

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.)

课程安排				
周	理论	学时	实验	学时
1	导论 课程介绍 从沙子到云端，大数据的时代背景	2	学习使用 Matlab 或者 Python 对数据进行分析 和预处理	4
2	数据处理的基本原理 • 数据收集 • 数据提取 • 数据清理	2	学习使用 Matlab 或者 Python 对数据进行分析 和预处理	4
3	传统智能系统模型 • 线性回归模型 • 分类模型 • 集成学习 • 支撑向量机 • 聚类 • 神经网络	2	用 Matlab 实现一些基本模型	4
4	新型智能系统模型 • 深度学习 • 强化学习 • 对抗网络 • 有监督的学习和无监督的学习		用 TensorFlow 实现简单的网络模型	4
5	项目开题报告	2	项目开题报告	4
6	大数据的云管端分层结构	2	MCU 上 hello world 实验	4
7	大数据时代的嵌入式系统演进	2	蓝牙 mesh 网络实践	4
8	大数据时代的通信技术演进	2	基于 5G 的机器人远程控制实践	4
9	期中小论文和案例分析	2	期中小论文和案例分析	4
10	大数据时代的服务器系统演进	2	容器的使用部署	4
11	大数据时代的云端系统演进	2	云端部署的机器学习	4
12	大数据时代的传感器演进 1	2	研讨会： • 摩尔定律 • 处理器和专用集成电路的发展 • 大数据处理带来的集成电路性能需求和 演进路线	4
13	大数据时代的传感器演进 2	2	多光谱成像实践	4
14	大数据在农业中的落地案例	2	无人农场实践	4

15	大数据在机器人行业中的落地案例	2	楼宇管理机器人部署	4
16	总结和复习	2	项目结题报告	4
Schedule				
Week	Lecture	Hours	Lab	Hours
1	Introduction <ul style="list-style-type: none"> Course Introduction From sand to cloud, the background of the bigdata era 	2	Learn to use Matlab or Python to analyze and preprocess data	4
2	Data preprocessing <ul style="list-style-type: none"> Data collection Data Extraction Data cleaning 	2	Learn to use Matlab or Python to analyze and preprocess data	4
3	Traditional Models of Intelligent Systems <ul style="list-style-type: none"> Linear Model for Regression Linear Models for Classification Support Vector Machine Ensemble Learning Neural Networks 	2	Use Matlab or Python to implement some basic models.	4
4	Trending Models of Intelligent Systems <ul style="list-style-type: none"> Deep learning Reinforcement learning Generative Adversarial Network Supervised and unsupervised learning 	2	Use TensorFlow to build some simple deep networks	4
5	Proposal Presentations	2	Project proposal	4
6	Big data flow through cloud/pipe/terminal	2	Hello world on an MCU	4
7	Evolution of Embedded Systems at Bigdata Era	2	Practice of Bluetooth mesh network	4
8	Evolution of Communications Technologies at Bigdata Era	2	5G based robot remote control practice	4
9	Mid-term essay and case study	2	Mid-term essay and case study	4
10	Evolution of Server Systems at Bigdata Era	2	Deployment of container	4
11	Evolution of Cloud Computing at Bigdata Era	2	ML on cloud	4
12	Evolution of Sensors at Bigdata Era 1	2	Workshop : <ul style="list-style-type: none"> Moore's law Processors and ASIC Semiconductor performance and evolution demanded by bigdata 	4

13	Evolution of Sensors at Bigdata Era 2	2	Multispectral imaging system practice	4
14	Bigdata in agriculture: Case Study	2	Unmanned farm practice	4
15	Bigdata in robot industries: Case Study	2	Service robot practice	4
16	Summary & Revision	2	Final projects	4

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

Textbook:

The course covers an area that is too wide to be covered by one textbook. A list of reference books will be provided after each lecture.

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				
课堂表现 Class Performance				
小测验 Quiz	1-16 周 Week 1-16	20	NIL	2 次 Two times
课程项目 Projects	第 5 周 Week 5	10	NIL	开题报告 Project proposal
平时作业 Assignments	1-16 周 Week 1-16	20	NIL	5 次 Five times
期中考试 Mid-Term Test				
期末考试 Final Exam				
期末报告 Final Presentation	第 16 周 Week 16	50	NIL	项目结题报告 Final project report
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

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