

## 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.	<b>课程名称 Course Title</b>	高级机器学习 Advanced Machine Learning
2.	<b>授课院系 Originating Department</b>	系统设计与智能制造学院 School of System Design and Intelligent Manufacturing
3.	<b>课程编号 Course Code</b>	SDM359
4.	<b>课程学分 Credit Value</b>	3
5.	<b>课程类别 Course Type</b>	专业选修课 Major Elective Courses (请保留相应选项 Please only keep the relevant information)
6.	<b>授课学期 Semester</b>	春季 Spring
7.	<b>授课语言 Teaching Language</b>	中英双语 English & Chinese (请保留相应选项 Please only keep the relevant information)
8.	<b>授课教师、所属学系、联系方式 Instructor(s), Affiliation &amp; Contact</b> (For team teaching, please list all instructors)	刘德荣 讲席教授 系统设计与智能制造学院 <a href="mailto:liudr@sustech.edu.cn">liudr@sustech.edu.cn</a> Derong Liu Chair Professor School of System Design and Intelligent Manufacturing
9.	<b>实验员/助教、所属学系、联系方式 Tutor/TA(s), Contact</b>	待公布 To be announced
10.	<b>选课人数限额(可不填) Maximum Enrolment (Optional)</b>	

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
	48	0	0	0	48
学时数 Credit Hours					
12. 先修课程、其它学习要求 Pre-requisites or Other Academic Requirements	MA113 线性代数 Linear Algebra				
13. 后续课程、其它学习规划 Courses for which this course is a pre-requisite	无 N/A				
14. 其它要求修读本课程的学系 Cross-listing Dept.	无 N/A				

### 教学大纲及教学日历 SYLLABUS

#### 15. 教学目标 Course Objectives

本课程旨在提供有关神经网络、模糊系统和演化计算的基本知识，从而了解计算智能的基本内容。希望学生通过本课程了解灵感、设计、理论、以及解决实际问题的实用知识。

This course aims to provide coverage to three fundamental topics that form the basis of computational intelligence: neural networks, fuzzy systems, and evolutionary computation. The course focuses on inspiration, design, theory, and practical aspects of implementing procedures to solve real-world problems.

#### 16. 预达学习成果 Learning Outcomes

在本课程学习完成时，学生应该掌握感知机、多层神经网络、径向基函数网络、递归神经网络、模糊集理论、模糊关系、模糊推理、模糊聚类和分类、模糊测度和模糊积分、演化优化、演化学习、群体智慧。

Upon completion of this course, students should master single-layer and multilayer neural networks, radial-basis function networks, recurrent neural networks, fuzzy set theory, fuzzy relations, fuzzy logic interference, fuzzy clustering and classification, fuzzy measures and fuzzy integrals, evolutionary optimization, evolutionary learning and problem solving, and collective intelligence.

#### 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.)**

第一周：导论

第二周：感知机

第三周：多层神经网络

第四周：反传算法

第五周：径向基函数网络

第六周：递归神经网络

第七周：基础模糊集理论

第八周：模糊关系和模糊逻辑推理

第九周：期中复习和考试

第十周：模糊聚类与分类

第十一周：模糊测度和积分

第十二周：演化计算

第十三周：演化优化

第十四周：演化学习与问题求解

第十五周：群体智慧与延申

第十六周：期末项目与复习

Week 1: Introduction

Week 2: Single-Layer Neural Networks

Week 3: Multilayer Neural Networks

Week 4: Backpropagation

Week 5: Radial-Basis Function Networks

Week 6: Recurrent Neural Networks

Week 7: Basic Fuzzy Set Theory

Week 8: Fuzzy Relations and Fuzzy Logic Inference

Week 9: Midterm Review and Exam

Week 10: Fuzzy Clustering and Classification

Week 11: Fuzzy Measures and Fuzzy Integrals

Week 12: Evolutionary Computation

Week 13: Evolutionary Optimization

Week 14: Evolutionary Learning and Problem Solving

Week 15: Collective Intelligence and Other Extensions

Week 16: Final Projects and Review

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

J. Keller, D. Liu, and D. Fogel, *Fundamentals of Computational Intelligence—Neural Networks, Fuzzy Systems, and Evolutionary Computation*. New York: IEEE/Wiley, 2016 (ISBN: 978-1-119-21434-2).

**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		15		
课程项目 Projects		10		
平时作业 Assignments		15		
期中考试 Mid-Term Test		20		
期末考试 Final Exam		40		
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