

DS323 课程大纲

- 1、2022 秋季学期 (2-7 页码)
- 2、2023 秋季学期起 (8-13 页码)

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	人工智能与设计 AI in Design
2.	授课院系 Originating Department	创新创意设计学院 School of Design
3.	课程编号 Course Code	DS323
4.	课程学分 Credit Value	3
5.	课程类别 Course Type	专业选修课 Major Elective Course
6.	授课学期 Semester	秋季 Autumn
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)	Fang Wan Assistant Professor, School of Design wanf@sustech.edu.cn 万芳 助理教授, 创新创意设计学院 wanf@sustech.edu.cn

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		32		64
12.	先修课程、其它学习要求 Pre-requisites or Other Academic Requirements	无 N/A				
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

本课程的目的建立设计与人工智能的桥梁，涵盖了人工智能的基本理论概念和应用框架，包括机器学习、深度学习、数据、智能产品的设计流程和技术要求分析。学生将学习和实践人工智能赋能的产品和服务设计，充分在设计中利用人工智能技术来创造用户价值、商业价值和社会价值，其中技术包括视觉智能、刚柔交互、生成设计。通过本课程的学习，学生能够与人工智能科学家和工程师交流与协作，完成 AI 赋能产品和服务的设计与开发。本课程可根据校外合作机构相关安排等情况组织实地考察，课程内容可能会根据课程目标和实际情况调整。

The goal of this course is to build a bridge between the discipline of design and that of artificial intelligence (AI). The course covers basic concepts and frameworks of artificial intelligence and its applications, including machine learning, deep learning, source of data, design process and decomposition of the design needs for technique requirements. This

course is intended for design students aiming at shaping products and services powered by AI, leveraging vision-based intelligence, rigid-soft material interaction, generative design, and user interaction into user, business, and social value, promoting adoption of AI in design across disciplines. By the end of this course, the students should be able to communicate and collaborate with AI scientists and engineers while developing new product or service solutions with AI. The course will include field trips depending on availability and external collaborator and the contents are subject to change to fulfill the course objectives.

本课程有安排实地考察和与外部公司合作的可能性。届时课程内容和活动安排将会调整。

This course will include field trips and collaborations with external companies depending on availability. Lecture and activity schedules are indicative and may be adjusted.

16. 预达学习成果 Learning Outcomes

在本课程结束时，学生将能够：

1. 根据需求和场景发现人工智能技术在用户、商业、社会价值方面的创新应用。
2. 展示能够在智能算法系统中平衡用户需求与价值。
3. 应用人工智能开展设计实践。

At the end of this course, students will be able to:

1. Spot and describe opportunities to leverage AI for users, business, and social value within a given context.
2. Demonstrate ability to align user needs and guard human values within algorithmic systems.
3. Employ AI concepts in applied design practice.

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.)

Week	Content
1	<p>Lecture (4 hours) INTRODUCTION TO ARTIFICIAL INTELLIGENCE IN DESIGN Course introduction, group formation, introduction of external collaborator. Get familiar with the concept of artificial intelligence and how they have been used in design of various products and services in various scenarios. Understand the concept of economic rationality while designing AI-driven products with optimization.</p> <p>Practice (4 hours) Introduction to AI meets Design toolkit; A crash course in AI+ML.</p>
	<p>Lecture (4 hours) A GENTLE DIVE INTO MACHINE LEARNING AND DEEP LEARNING Identify various machine learning algorithms and study the different approaches such as Bayesian and regression models. Learn about unsupervised and semi-supervised methods of machine learning algorithms. Explore the basics of deep learning, including neural networks, artificial neurons, and simulation of complex networks.</p> <p>Practice (4 hours) Basic machine/deep learning with Python/TensorFlow (or equivalent); User-centered problem solving.</p>
2	<p>Lecture (4 hours) DATA-CENTERED REPRESENTATION OF ARTIFICIAL INTELLIGENCE Understand the process of a structured decomposition of the design needs for technical requirements while developing AI-powered products. Get familiar with various source of data, how they are presented, how to understand them, and how they are used in exemplified products.</p> <p>Practice (4 hours) Vision-based tactile sensing with deep learning; Tech/Data-driven opportunity spotting.</p>
	<p>Lecture (4 hours) GENERATIVE DESIGN WITH RIGID AND SOFT INTERFACES Introduce the computer-aided design process with parametric definition of physical products. Get familiar with advanced algorithms and tools that are commercially available to automatically generate physical designs with optimized engineering performances.</p> <p>Practice (4 hours) Generative design with Autodesk Fusion 360; AI prompt card deck for ideation.</p>
3	<p>Lecture (4 hours) Interim Review with invited guests, revise according to feedback.</p> <p>Practice (4 hours)</p>

	Impact matrix for idea selection; Value proposition design; Assessing feasibility.
	<p>Lecture (4 hours) HUMAN MACHINE INTERACTION Use the resources provided in this module to understand the techniques, application areas, benefits, and drawbacks of HCI. Learn to define an appropriate level of machine involvement in interactions with humans and computers. Seek ways to use artificial intelligence to your advantage.</p> <p>Practice (4 hours) Framing your task; User research & feedback.</p>
4	<p>Lecture (4 hours) PRACTICE AI IN DESIGN Implement a hierarchical model to define success and failure for AI in design. Design and construct a summary of an AI product or process using learnings from the previous classes.</p> <p>Practice (4 hours) Prototyping & testing; Mapping user needs to models; Metrics to evaluate by.</p>
	<p>Lecture (4 hours) IMPLEMENTATION AND PRESENTATION Review of UX and design challenges of AI-driven products and services. Capture the design tension and practice consequence wheel.</p> <p>Practice (4 hours) Final presentation.</p>

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

(1996) The Sciences of the Artificial (Third Edition), Herbert A. Simon, The MIT Press.
(2019) AI meets Design Toolkit, Nadia Piet, online.

课程评估 ASSESSMENT

19. 评估形式 Type Assessment	评估时间 of Time	占考试总成绩百分比 % of final score	违纪处罚 Penalty	备注 Notes
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出勤 Attendance		10%		
课堂表现 Class Performance				
小测验 Quiz				
课程项目 Projects				
平时作业 Assignments		20%		
期中考试 Mid-Term Test				
期末考试 Final Exam				
期末报告 Final Presentation		70%		
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

Professor Tom Kvan
Dean, School of Design

课程详述

COURSE SPECIFICATION

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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)	Fang Wan Assistant Professor, School of Design wanf@sustech.edu.cn 万芳 助理教授, 创新创意设计学院 wanf@sustech.edu.cn

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course is intended for design students aiming at shaping products and services powered by AI, leveraging technologies such as intelligent perception and generative design into user, business, and social value, promoting adoption of AI in design across disciplines. By the end of this course, the students should be able to communicate and collaborate with AI scientists and engineers while developing new product or service solutions with AI. The course will include field trips depending on availability and external collaborator and the contents are subject to change to fulfill the course objectives.

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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.)

Week	Content
1	<p>Lecture (4 hours)</p> <p>INTRODUCTION TO ARTIFICIAL INTELLIGENCE IN DESIGN</p> <p>Course introduction, group formation, introduction of external collaborator.</p> <p>Get familiar with the concept of artificial intelligence and how they have been used in design of various products and services in various scenarios. Understand the concept of economic rationality while designing AI-driven products with optimization.</p>
2	<p>Practice (4 hours)</p> <p>Case studies of AI empowered products or services.</p>
3	<p>Lecture (4 hours)</p> <p>A GENTLE DIVE INTO MACHINE LEARNING AND DEEP LEARNING</p> <p>Identify various machine learning algorithms and study the different approaches such as Bayesian and regression models. Learn about unsupervised and semi-supervised methods of machine learning algorithms. Explore the basics of deep learning, including neural networks, artificial neurons, and simulation of complex networks.</p>
4	<p>Practice (4 hours)</p> <p>Basic machine/deep learning with Python/Pytorch (or equivalent); User-centered problem solving.</p>
5	<p>Lecture (4 hours)</p> <p>DATA-CENTERED REPRESENTATION OF ARTIFICIAL INTELLIGENCE</p> <p>Understand the process of a structured decomposition of the design needs for technical requirements while developing AI-powered products. Get familiar with various source of data, how they are presented, how to understand them, and how they are used in exemplified products.</p>
6	<p>Practice (4 hours)</p> <p>Vision-based tactile sensing with deep learning; Tech/Data-driven opportunity spotting.</p>
7	<p>Lecture (4 hours)</p> <p>GENERATIVE DESIGN WITH RIGID AND SOFT INTERFACES</p> <p>Introduce the computer-aided design process with parametric definition of physical products. Get familiar with advanced algorithms and tools that are commercially available to automatically generate physical designs with optimized engineering performances.</p>
8	<p>Practice (4 hours)</p> <p>Introduction to AI meets Design toolkit; AI prompt card deck for ideation.</p>
9	<p>Lecture (4 hours)</p> <p>Interim Review with invited guests, revise according to feedback.</p>
10	<p>Practice (4 hours)</p> <p>Impact matrix for idea selection; Value proposition design; Assessing feasibility.</p>

11	<p>Lecture (4 hours)</p> <p>HUMAN MACHINE INTERACTION</p> <p>Use the resources provided in this module to understand the techniques, application areas, benefits, and drawbacks of HCI. Learn to define an appropriate level of machine involvement in interactions with humans and computers. Seek ways to use artificial intelligence to your advantage.</p>
12	<p>Practice (4 hours)</p> <p>Framing your task; User research & feedback.</p>
13	<p>Lecture (4 hours)</p> <p>PRACTICE AI IN DESIGN</p> <p>Implement a hierarchical model to define success and failure for AI in design. Design and construct a summary of an AI product or process using learnings from the previous classes.</p>
14	<p>Practice (4 hours)</p> <p>Prototyping & testing; Mapping user needs to models; Metrics to evaluate by.</p>
15	<p>Lecture (4 hours)</p> <p>IMPLEMENTATION AND PRESENTATION</p> <p>Review of UX and design challenges of AI-driven products and services. Capture the design tension and practice consequence wheel.</p>
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课程项目 Projects				
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期末报告 Final Presentation		70%		
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