



人工智能如何赋能教育

数字化转型

Artificial Intelligence in Education (AIEd)



#1. 课程背景及简介



在“人工智能+教育”的时代背景下，各类数字学习资源、电子数字产品、学习授课方式已经通过不断的有机结合形成了新型的教育融通环境。人工智能技术正以新一轮浪潮迭代推进教育信息化的融合进程，聚力推进整个教育生态的重构与发展。

本课程将关注如何将人工智能应用于教育领域以解决和更新传统教学模式所带来的弊端。进一步解释技术如何赋能现代教育发展，构建以面向交互、感知、个性为特征的新型学习环境，为学生提供深度学习体验。课程将涵盖机器学习和人工智能在中小学和大学生教育中的应用。其中包括：智能化一对一辅导，适应性教学，AI 评估和跟踪学生的学习进度，构建智慧校园等内容。简而言之，就是需要通过教师和人工智能之间的协作来创造出对学生最有效的适应性教育。

本课程将分为理论和项目两部分。首先概述现有教育模式的现状，以及这些模式所带来的弊端，例如学生在课堂上失去注意力的原因，以及传统教学方法下学生成绩落后的原因。其次将探讨人工智能产品正试图将教育自动化的几个方面，包括游戏化教学模式、即时反馈、根据学生的强项和弱项对教育内容进行个性化设置等等。教授将带领学生学习这些自动化背后的 AI 算法理论并演示现有 AIEd 产品的功能。最后，学生会学习人工智能在教育领域的发展前景，如深度学习方法，自适应评估，学生表现预测等。课程结束后学生会完成一个实践项目，通过使用人工智能和机器学习的软件来分析教育数据并实现对教育实体的预测。

#2. 学习目标



本课程将解决许多挑战，如：

- ★ 探究现有教育模式中的挑战与弊端
- ★ 人工智能如何解决传统教育存在的问题
- ★ 掌握 AI 与机器学习背后的算法原理
- ★ 教育者与人工智能之间如何协调配合

#3. 任课教师信息



Prof. A L

教授目前就职于加州大学洛杉矶分校计算机科学学院的客座教授，曾任南加州大学客座教授，参与过迪士尼，美国银行等多家世界一百强企业的软件开发项目。从 2015 年至今一直担任美国 StaffRanker 科技公司的首席技术官。在计算机科学领域从业 25 年，有丰富的执教经验。



4. 课程设置

PBL

周期	时间	课程设置内容	课时
第一周 学习指南 教授及助教 辅导	1 月 28 日 周六	什么是 PBL 教学方法	1
		PBL 教学的常见形式	1
	1 月 29 日 周日	教授课-1 交叉学科 PBL 课程设计及知识点学习 学习目标：传统教育背景 描述：深入学习现有教育模式的架构以及存在的缺陷与弊端。人工智能对教育的影响；人工智能可能给教育带来的改变。教育领域可发展的自动化潜能。人工智能对教育改革的技术讨论	3
	1 月 30 日 周一	助教课-1 知识点查漏补缺	2
	1 月 31 日 周二	教授课-2 制定个人项目方向 学习目标：机器学习与人工智能 描述：机器学习与人工智能的基础知识, 利用 python, R 和 Octave 筛选和处理数据。人工智能背后的算法理论。AI 在教育领域的应用范围；最适合教育领域的人工智能产品，使用人工智能来弥补传统教育弊端的实例；智能学生学生评分与评价系统；个性化学习模式	3
第二周 教授及助教 辅导	2 月 1 日 周三	助教课-2 知识点查漏补缺	2
	2 月 2 日 周四	教授课-3 交叉学科课程知识点学习 学习目标：教育领域与人工智能产品 描述：学生学术表现预测；学生留级与劝退预测；监督式学习；教育智能推荐系统的技术理论	3



	2月3日 周五	助教课-3 知识点查漏补缺&跟进个人项目 调研进度	2
	2月4日 周六	教授课-4 互动与项目设计跟进答疑	1.5
	2月6日 周一	助教课-4 跟进个人项目调研进度	2
	2月7日 周二	教授课-5 交叉学科课程知识点学习 学习目标：教育与人工智能产品 描述：构建智能化校园，人工智 能监控系统和可视化分析。针对 不同学生的智能化辅导。现有 AI 范式的局限性。人工智能可能带 来的社会道德性问题。机器学习的 技术弊端。	2
第三周 教授及助教 辅导 未来展望	2月8日 周三	助教课-5 跟进个人项目调研进度	2
	2月9日 周四	教授课-6 交叉学科课程知识点学习 学习目标：人工智能的教育领域 的发展前景 描述：人工智能对教育方式的改 革。如何提高教育者的教学和讲 课效率。提升和更新传统教育系 统。人工智能在教育领域可能带 来的问题。	2
	2月10日 周五	助教课-6 知识点查漏补缺&指导个人项目 成果展示	2
	2月11日 周六	教授课-7 教授点评个人项目成果	1.5
	2月12日 周日	升学与就业方向展望	1
		个人规划及发展建议	1
总课时	32		

#5. 阅读材料



- ★ Python tutorial: no math or programming background needed, free book download, including TensorFlow
- ★ Octave tutorial: included in the tutorial for Intro to ML below
- ★ Git and Github tutorial: this platform is useful for submitting your project code for grading and versioning
- ★ Introduction to Machine Learning
- ★ Introduction to Artificial Intelligence
- ★ Deep Learning
- ★ Neural Networks

#6. 项目主题



本课程使用 PBL 教学法，PBL 即项目式学习，是一种以学生为中心的教学方法，教师提供关键素材构建学习环境，学生通过在此环境里解决一个开放式项目的经历来学习。以下为本课程可选的项目主题：

- 学生智能评分与评价系统
- 个性化学习模式
- 学生学术表现预测
- 学生辍学预测：监督式学习
- 教育情感分析
- 教育推荐系统
- 教室智能监控系统与可视化分析
- 智能教学系统

英文版教学大纲



Course Title	Artificial Intelligence in Education (AIEd)
Credit Hours	32 (one credit hour is 45 minutes)
Course Objectives	This course will focus on how AI is being utilized in the field of education to address gaps and update traditional teaching models. The course will provide basic knowledge in machine learning and AI, and applications in effectively educating school



	<p>and college students. Some AI applications that will be covered include:</p> <ol style="list-style-type: none">1. one-on-one personalized tutoring2. adaptive teaching3. assessments and grading4. tracking and monitoring student behavior and focus-levels5. teaching languages6. building smart campuses <p>In short, there is a need for smart collaboration between teacher and AI to provide optimal, adaptive, and effective education to students. The course is directed at computer science students who have coding and mathematical skills, and educators in all other areas. Learning will be project-based, with an option of either a coding-based project or acquiring advanced knowledge about an existing AI-based tool covered in the course.</p>
Course Description	<p>This project-based learning course will be divided into 2 parts: theory and project. The course will begin by providing an overview of the challenges of existing education models, loopholes exhibited by these models, reasons students lose focus in class, and why they fall behind using traditional teaching methods. AI products are trying to automate several aspects of education, including making the models more acceptable to students by gamifying them, by providing immediate feedback, by personalizing the education content based on student's strong and weak areas, etc.</p> <p>In this course, we will take a deep-dive into some of these aspects. We will provide you the theory behind AI algorithms for resolving</p>



	<p>these gaps; and demonstrate capabilities of existing AIEd products. AIEd theory will be complemented with quizzes and projects.</p> <p>After each class, you will take a quiz covering the material discussed during the class. The instructor will also provide additional reading material that will help you get a stronger grasp of the concepts discussed during lectures. Finally, you will be doing a group project; you will be provided some topics to choose from, but any other good ideas that your group may have are also welcome.</p> <p>The course will teach some minimal programming to beginners required to perform some basic AI/ML operations. All programming and project based material will be taught by the TA assigned to the course. The TA will also assist you with setting up the tools and programming environments needed for the course.</p> <p>The course will end with the future of AI in Education, like Deep Learning methods, adaptive assessment and grading, performance prediction, and student retention. At the end of the course, you will not only have a wide knowledge of AI methodologies used to fill gaps in Education, but you will also have hands-on experience with some tools available in the market. You will gain knowledge of what AI and ML are, and how to run analytics with Educational data, try to find unknown insights hidden in the data, and provide recommendations to the educational entity.</p>
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Main Challenges

This class will take a close look at the challenges and loopholes in existing education models, and discuss how the field of Artificial Intelligence is helping



resolve these challenges, saving time for educators, and making the process more streamlined and efficient. We will discuss challenges faced by students, educators, parents, and institutions.

Class Expectation

Earlier in this document, we listed the models, methodologies, tools, and algorithms that'll be covered in this course. Not only will you come out knowledgeable about ML and AI methodologies in Education, you will be in a position to apply these algorithms in other fields as well like finance, sports, medicine, etc. Specifically, in educational area, you will be able to run analytics on data from your own department or college, explore gaps, and recommend solutions. The background you will gain will be very useful in your job applications or for graduate school applications, particularly if you want to continue working in the field of AI.

Required Readings

For a majority of ML/AI applications, a knowledge of high-school level linear algebra is very important, e.g., vectors and matrices, and their properties. In addition, you can also learn free ML tools like Octave (by Stanford University) that will be utilized in this course; it is similar to R programming language recommended by other instructors. In case you'd like to do a coding-based project, an appropriate background would be needed to jump-start your project for this course. If you'd like to learn about some basic programming used in this course, here's a list of free courses recommended for you:

- Python tutorial: no math or programming background needed, free book download, including TensorFlow
- Octave tutorial: included in the tutorial for Intro to ML below
- Git and Github tutorial: this platform is useful for submitting your project code for grading and versioning

And to get a good background on machine learning and artificial intelligence fields,

- the following courses are recommended:
- Introduction to Machine Learning
- Introduction to Artificial Intelligence
- Deep Learning
- Neural Networks

Apart from the above, there are several free courses on data science, data analytics, etc. that you can take for advancing your own knowledge.

Final Project: Topics & Expectations

You can choose any one of the 8 areas of AI in Education that we will be covering in the course. Apart from these, we welcome your own ideas, e.g., aspects of education that you think are not covered in these 8 topics.

Here's what is expected of you for your project:

- Project must use the concepts of AI application in the field of Education
- Based on class size, you can form teams of 2-3 students for a project
- You should propose a ML/AI methodology that will be used in your project
- You can search Coursera (or other similar platforms) and complete courses that will build your background for your idea
- Your team will be responsible to search the web (like Kaggle or Github) for the required data
- In your proposal, you will be required to present the AI methodology that you're going to apply, the kind of data that you're going to use, the area of Education where AI will be applied, insights that you are expecting to uncover, and any drawbacks or loopholes in your criteria
- You will demonstrate your project and findings to the entire class during one of our live lectures. You will have 5 mins to present your proposal.

	Topics
Module 1	Objective: Introductions Description: Introductions: instructor, TA, consultant Introduction to course
Module 2	Objective: Background Description: Background and pitfalls of traditional education models Impact of AI in education
Module 3	Objective: AI Applications & Projects Description: AI application areas Project ideas & expectations
Module 4	Objective: Machine Learning & Artificial Intelligence Description: Python, R or Octave Introduction to ML and AI

	Pointers where ML and AI courses can be completed
Module 5	Objective: Education Areas & AI Products While covering the following 8 areas, we will follow a consistent pattern: Describe theory and challenges of the education area Methodologies most suited to the education area Demonstrate a market tool that uses AI to fix some of the gaps Description: Student grading and evaluation Personalized learning
Module 6	Objective: Education Areas & AI Products (contd.) Description: Students' performance prediction Student retention and dropout prediction: supervised learning
Module 7	Objective: Education Areas & AI Products (contd.) Description: Sentiment analysis in education Recommendation systems in education
Module 8	Objective: Education Areas & AI Products (contd.) Description: Classroom monitoring and visual analysis Intelligent tutoring system
Module 9	Objective: Limitations and Pitfalls in Existing AI Paradigms Description: Technological and social aspects
Module 10	Objective: AI in the Future of Education Teaching methods and pedagogy Supporting educator effectiveness Improving education systems AI issues and concerns

Final Word

You are all very bright students of Beijing, and you will come out brighter in the field of ML, AI, Education at the end of this course. I am delighted to be your instructor for this course. I have assistance from my colleagues around the world, who are experts in this field. And the TA for this course is very knowledgeable and proficient. We are going to have fun for the next 12 lectures.