



## Data Science: Artificial Intelligence

2 Credits

BU.920.624.M1 | Fall 2025

Downtown Baltimore, Harbor East, Room 206

10-23-2025 to 12-18-2025 (Thursdays) | 8:30–11:30 AM

**Instructor:** Tinglong Dai, PhD, Bernard T. Ferrari Professor of Business

Email: [dai@jhu.edu](mailto:dai@jhu.edu) | Office: Room 1216 | Phone: (410) 234-9415 | Office Hours: Thursdays 5–6 PM

**TA:** Suhas Sasetty, MS in Computer Science, Johns Hopkins University

Email: [ssasett1@jh.edu](mailto:ssasett1@jh.edu) | Office Hours: Wednesdays from 1–2 PM via [Zoom](#) or by appointment

### Required Texts & Learning Materials

The required materials for this course include a textbook, an HBS teaching case, slide decks (available at the beginning of each session to facilitate note-taking and post-session review), and a set of readings posted on Canvas.

#### Required Text:

Chollet, F. (2025) *Deep Learning with Python, 3rd Edition*. Manning. ISBN: 9781633436589. Read free: <https://deeplearningwithpython.io>

#### Required Case (to be provided by the instructor):

Li, M., and T. Dai. 2025. The Future in Sight: LumineticsCore and the First Autonomous AI for Diagnostics. *Harvard Business School Case*. Product #: 626019-PDF-ENG.

#### Optional Texts:

1. Krohn, J., G. Beyleveld, and A. Bassens (2020) *Deep Learning Illustrated: A Visual, Interactive Guide to Artificial Intelligence*. Addison-Wesley Professional. ISBN: 978-0135116692.
2. Agrawal, A., J. Gans, and A. Goldfarb (2022) *Power and Prediction: The Disruptive Economics of Artificial Intelligence*. Harvard Business Review Press. ISBN: 978-1647824198.
3. Wolfram, S. (2023) *What Is ChatGPT Doing ... And Why Does It Work?* Wolfram Media, Inc. ISBN: 978-1579550813 (hardcover), 978-1579550820 (eBook).

**Complimentary Access to News Media:** Johns Hopkins and Carey offer free access to major news media outlets, including The Economist, Financial Times, New York Times, and Wall Street Journal—subscriptions worth thousands of dollars per year. Frequent access to these outlets is essential, as they provide critical coverage of AI developments. It is the responsibility of each student to activate their complimentary access before the class begins. Instructions for activation can be found at <https://ask.library.jhu.edu/faq/44659>.

#### Required Readings:

The following list of required readings will be assigned for individual sessions. Students are expected to at least skim each assigned reading before class; a thorough reading is expected after the corresponding session.

1. Andreessen, M. (2023). "Why AI Will Save the World." June 6. <https://a16z.com/2023/06/06/ai-will-save-the-world/>
2. Criddle, C. (2025, September 5). Computer scientist Geoffrey Hinton: "AI will make a few people much richer and most people poorer." *Financial Times*. <https://www.ft.com/content/31feb335-4945-475e-baaa-3b880d9cf8ce>
3. Cummings, M. L. (2023). "What Self-Driving Cars Tell Us About AI Risks." *IEEE Spectrum*. <https://spectrum.ieee.org/self-driving-cars-2662494269>
4. FT. (2023). "Generative AI Exists Because of the Transformer. This Is How It Works." *Financial Times*, September 12. <https://ig.ft.com/generative-ai/>
5. Halpern, M. (2020). "No Ghost in the Machine." *The American Scholar*, Mar. 2. <http://bit.ly/3qcRrT7>
6. Lee, B., Patel, S., Favorito, C., Sandri, S., Jennings, M. R., Dai, T. (2025). Development and Commercialization Pathways of AI Medical Devices in the United States: Implications for Safety and Regulatory Oversight. *NEJM AI*, 2(7), Alra2500061. <http://bit.ly/fdaai25>
7. Millbrook, A. (2023). "A Short History of Tractors in English: What the Tractor and the Horse Tell You About Generative AI." *The Economist*, Dec. 20. <https://www.economist.com/christmas-specials/2023/12/20/a-short-history-of-tractors-in-english>
8. Mims, C. (2022). "How to Build AI That Actually Works for Your Business." *Wall Street Journal*, July 23. <https://on.wsj.com/3P4GVZV>
9. Moor, M., et al. (2023). "Foundation Models for Generalist Medical Artificial Intelligence." *Nature*, 616, pp. 259–265. <https://www.nature.com/articles/s41586-023-05881-4>
10. Price, W. N., II, Gerke, S., Cohen, I. G. (2019). "Potential Liability for Physicians Using Artificial Intelligence." *JAMA*, 322, pp. 1765–1766. <https://jamanetwork.com/journals/jama/article-abstract/2752750>
11. Rothman, J. (2025). "A.I. Is Coming for Culture." *The New Yorker*, August 25. <https://www.newyorker.com/magazine/2025/09/01/ai-is-coming-for-culture>
12. Sagona, M., Dai, T., Macis, M., Darden, M. (2025). "Trust in AI-Assisted Health Systems and AI's Trust in Humans." *npj Health Systems*, March 28. <https://www.nature.com/articles/s44401-025-00016-5>
13. Sahni, N.R., Carrus, B. (2023). "Artificial Intelligence in U.S. Health Care Delivery." *New England Journal of Medicine*, 389, pp. 348–358. <https://www.nejm.org/doi/full/10.1056/NEJMra2204673>
14. Smith, C. S. (2022). "'No-Code' Brings the Power of A.I. to the Masses." *New York Times*, Mar. 15. <https://nyti.ms/3p78s2g>

### Course Description

Since its inception in the 1950s, artificial intelligence (AI) has evolved through various competing ideas and techniques from multiple disciplines, including computer science, economics, ethics, linguistics, mathematics, operations research, philosophy, psychology, and statistics. Since 2012, deep learning has taken center stage in AI, expanding its applications to virtually every industry and sector. The launch of ChatGPT in November 2022 marked another milestone in AI with the emergence of generative AI (GenAI), which some have called the "iPhone moment" of AI.

This course demystifies AI by introducing key concepts, including its mathematical and computational foundations, economic forces, and role in the business world. Students will learn how to develop predictive and generative AI applications that transform structured and unstructured data into tools that create business and human value. Emphasis is placed on developing AI strategies in various business scenarios, such as operations and supply chain management, marketing, and marketplace design. The course will also cover the integration of AI into business workflows to improve productivity, access, and equity. In addition, students will develop AI leadership skills that synthesize human and non-human intelligence, with an understanding of the inner workings and limitations of AI, including how AI can reinforce or mitigate human biases. By the end of the course, students will be prepared to lead AI initiatives that drive innovation and efficiency across multiple business domains.

### **Learning Objectives**

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

1. Understand the computational, mathematical, and economic foundations of AI and how they shape the past, present, and future of AI.
2. Analyze AI's role across business scenarios (e.g., operations & supply chain, marketing, marketplace design).
3. Apply Keras and various generative AI tools to build AI applications from structured and unstructured data that create business and human value.
4. Evaluate AI's limitations and the implications for leadership and ethics.

### **Attendance**

Attendance and class participation are part of each student's course grade. Students are expected to attend all scheduled class sessions. Each class will include opportunities for teams to work together. Failure to attend class will result in an inability to achieve the objectives of the course. Excessive absence will result in loss of points for team participation. Regular attendance and active participation are required for students to successfully complete the course. An in-class quiz may be included in each session for the purpose of checking attendance and providing ongoing feedback.

### **Classroom Protocol**

I will come to class fully prepared each day, and I expect you to do the same. Being "prepared" means that you have thoroughly read the assigned materials, made a sincere effort to complete the exercises or answer the assigned questions, and are willing to actively participate in class. The assumption is that we all have something valuable to contribute to and want to benefit from the collective learning process. Your preparation will maximize the benefits for everyone.

Some of the academic work in this course will be done in small study groups. The Carey Business School Honor Policy requires participants to honor our commitments to each other. Therefore, conscientious participation in group work is mandatory. Failure to contribute adequately to the group may result in a grade penalty as determined by me, and repeated behavior will result in an academic performance review.

Your class participation grade will be based on the quality of your contributions to group learning. This may include thoughtful questions, insightful answers, observations, and shared experiences. It's not about how often you speak, but the substance of your contributions.

### **Assignments**

Assignment	Learning Objectives	Weight
Class Participation	1-4	14%
Group Assignments	1, 2, 4	26%
AI Lab	3	30%
Individual Final Exam	1, 2, 4	30%

Assignment	Learning Objectives	Weight
Total		100%

Whereas class participation and final exam are evaluated on an individual basis, group assignments and the AI Lab are evaluated based on group submissions. Each group consists of 3–4 students. All groups must be formed by the 2<sup>nd</sup> class meeting at the latest.

**Group Assignments.** Two group assignments will be posted on Canvas to enhance the understanding of key concepts and develop skills necessary for linking business with AI. Each written case analysis should conform to a layout template posted on Canvas and address all the questions in the template. The assignment is due on Canvas one hour before class. Tardy submissions will not be accepted.

**AI Lab.** Students will work in groups to identify a business or societal setting in which AI can play a role in transforming unstructured (and structured) data into tools with the potential to generate business and human value. Each group will submit a proposal by Week 4, develop a prototype of an AI-based business or societal solution using Keras (or other tools), and submit a final report by Week 7. The proposal and final report will be evaluated based on their effort, creativity, and potential business and human impact.

### Grading

The grade of A is reserved for those who demonstrate extraordinary performance as determined by the instructor. The grade of A- is awarded only for excellent performance. The grades of B+ and B are awarded for good performance. The grades of B-, C+, C, and C- are awarded for adequate but substandard performance. The grades of D+, D, and D- are not awarded at the graduate level. The grade of F indicates the student's failure to satisfactorily complete the course work. For Core/Foundation courses, the grade point average of the class should not exceed 3.35. For Elective courses, the grade point average should not exceed 3.45.

### Policy on Generative AI

Academic integrity is a cornerstone of Carey Business School. Generative artificial intelligence (AI) tools such as ChatGPT are widely available, and these technologies present a number of exciting opportunities in the classroom. In this course, you may (and are encouraged to) use generative AI tools in all assignments and assessments without citation, but you may **not** use the tools during the individual final exam.

### TA Tutorials

Our TA will offer a total of four TA tutorials, covering a range of topics that include Python programming, Keras, CNNs, and LLM API programming. These tutorials are optional but are encouraged for students interested in deepening their technical understanding of course materials.

### Tentative Course Calendar

Instructors reserve the right to alter course content and/or adjust the pace to accommodate class progress. Students are responsible for keeping up with all adjustments to the course calendar.

Week	Topic	Reading	Due
1	<b>Introduction to AI: Foundations and Business Strategy</b>	<i>Deep Learning with Python, 3rd Edition</i> , Chapter 1 Halpern, M. (2020) "No Ghost in the Machine," <i>The American Scholar</i> (Mar. 2). Andreessen, M. (2023). "Why AI Will Save the World." Criddle, C. (2025). Computer scientist Geoffrey Hinton: "AI will make a few people much richer and most people poorer." <i>Financial Times</i> (Sept. 5)	

Week	Topic	Reading	Due
2	<b>Machine Learning, Deep Learning, and Introduction to AI Lab</b>  <b>Keras, Python, Generative AI, and No-Code AI Tools</b>	<i>Deep Learning with Python, 3rd Edition</i> , Chapters 2 and 5  Mims, C. (2022) "How to Build AI that Actually Works for Your Business," Wall Street Journal (July 23).  Smith, C. S. (2022) "No-code' Brings the Power of A.I. to the Masses," New York Times (Mar. 15).	
3	<b>Convolutional Neural Networks</b>  <b>Using AI to Create Human Value</b>	<i>Deep Learning with Python, 3rd Edition</i> , Chapter 8  Lee, B., Patel, S., Favorito, C., Sandri, S., Jennings, M. R., Dai, T. (2025). Development and Commercialization Pathways of AI Medical Devices in the United States: Implications for Safety and Regulatory Oversight. NEJM AI, 2(7).  Sahni, N.R., Carrus, B. (2023). "Artificial Intelligence in U.S. Health Care Delivery." New England Journal of Medicine, 389, pp. 348–358.	Group Assignment #1
4	<b>MLOps; AI Evaluation; Transformers</b>	Deep Learning with Python, 3rd Edition, Chapters 6 & 15  FT. (2023). "Generative AI Exists Because of the Transformer. This Is How It Works." Financial Times, September 12.	Proposal of AI Lab due
5	<b>Large Language Models and Generative AI</b>  <b>Using AI to Create Business Value</b>	Li, M., and T. Dai. 2025. The Future in Sight: LumineticsCore and the First Autonomous AI for Diagnostics. Harvard Business School Case.  Millbrook, A. (2023). "A Short History of Tractors in English: What the Tractor and the Horse Tell You About Generative AI." The Economist (Dec. 20)	Group Assignment #2
6	<b>Human–AI Interaction</b>  <b>Reinforcement Learning</b>	Price, W. N., II, Gerke, S., Cohen, I. G. (2019). "Potential Liability for Physicians Using Artificial Intelligence." JAMA, 322, pp. 1765–1766.  Cummings, M. L. (2023). "What Self-Driving Cars Tell Us About AI Risks." IEEE Spectrum.	
7	<b>Responsible AI Future of AI</b>	Sagona, M., Dai, T., Macis, M., Darden, M. (2025). "Trust in AI-Assisted Health Systems and AI's Trust in Humans." npj Health Systems.  Moor, M., et al. (2023). "Foundation Models for Generalist Medical Artificial Intelligence." Nature, 616, pp. 259–265.  Rothman, J. (2025). "A.I. Is Coming for Culture." The New Yorker (Aug. 25)	Final deliverable of AI Lab
8	Individual Final Exam		

## **Carey Business School Policies and General Information**

Please note that failure to become acquainted with Carey policies will not excuse any student from adhering to these policies.

### **Canvas Site**

A Canvas course site is set up for this course. Each student is expected to check the site throughout the semester as Canvas will be the primary venue for outside classroom communications between the instructor and students. Students can access the course site at <https://canvas.jhu.edu/>.

### **Technical Support**

24/7 technical support for questions regarding Canvas, Zoom, and other technical issues is available. Please refer to Carey's [Academic Resources webpage](#) for contact information and other details.

### **Students with Disabilities - Accommodations and Accessibility**

Johns Hopkins University values diversity and inclusion. We are committed to providing welcoming, equitable, and accessible educational experiences for all students. Students with disabilities (including those with psychological conditions, medical conditions, and temporary disabilities) can request accommodations for this course by providing an Accommodation Letter issued by [Student Disability Services](#). Please request accommodations for this course as early as possible to provide time for effective communication and arrangements. For further information or to start the process of requesting accommodations, please contact [Student Disability Services](#) at the Carey Business School.

### **Academic Ethics Policy**

Carey expects graduates to be exemplary global citizens in addition to innovative business leaders. The Carey community believes that honesty, integrity, and community responsibility are qualities inherent in an exemplary citizen. The objective of the Academic Ethics Policy (AEP) is to create an environment of trust and respect among all members of the Carey academic community and hold Carey students accountable to the highest standards of academic integrity and excellence.

It is the responsibility of every Carey student, faculty member, and staff member to familiarize themselves with the AEP and its procedures. Failure to become acquainted with this information will not excuse any student, faculty, or staff member from the responsibility to abide by the AEP. Please contact the [Office of Student Affairs](#) if you have any questions. For the full policy, please visit the [Academic Ethics Policy webpage](#).

### **Student Conduct Code**

The fundamental purpose of the Johns Hopkins University's regulation of student conduct is to promote and to protect the health, safety, welfare, property, and rights of all members of the University community as well as to promote the orderly operation of the University and to safeguard its property and facilities. Please contact the [Office of Student Affairs](#) if you have any questions regarding this policy. For the full policy, please visit the [Student Conduct Code webpage](#).

### **Commitment to Respect**

Respectful behavior creates an environment within the Carey Business School where all are valued and can be productive. Carey defines respectful behavior as conduct that, at a minimum, demonstrates consistent courtesy for others, including an effort to understand differences. As such, all in the community agree to the Carey Commitment to Respect, which states that we all strive to show that we value each other's human dignity and our differences, and to choose behavior and language that demonstrates mutual respect. Please visit the [Commitment to Respect webpage](#) to learn more about the expectations and resources available.

### **Classroom Policies for All On-Site and Remote-Live Classes**

Carey is committed to maintaining the highest standards of excellence in all forms of instruction. To that end, we have developed [policies and procedures for all classes offered in on-site and remote-live formats](#). These policies will govern all courses occurring in these formats, and all students are expected to familiarize themselves with and adhere to these policies.

### **Student Success Center**

The Student Success Center offers assistance in core writing and quantitative courses. For more information, visit the [Student Success Center webpage](#).

#### **Other Important Policies and Services**

Students are encouraged to consult the [Student Handbook and Academic Catalog](#) and [Student Services and Resources](#) for information regarding other policies and services. For your convenience, there is a singular website students can visit to learn about all [JHU and Carey policies](#).

#### **Copyright Statement**

Unless explicitly allowed by the instructor, course materials, class discussions, and examinations are created for and expected to be used by class participants only. The recording and rebroadcasting of such material, by any means, is forbidden. Violations are subject to sanctions under the [Academic Ethics Policy](#).